MUSEUMS ASSOCIATION.

CAMBRIDGE MEETING,

1891.

MUSEUMS ASSOCIATION.

REPORT OF PROCEEDINGS

WITH THE PAPERS READ AT THE

ANNUAL GENERAL MEETING

HELD AT CAMBRIDGE,

JULY 7th, 8th, & 9th, 1891.

EDITED BY

H. M. PLATNAUER, B.Sc.,

AND

E. HOWARTH, F.R.A.S.

PUBLISHED BY THE ASSOCIATION,

1891.

THE Association is to be congratulated on holding its second meeting in so excellent a centre as Cambridge. As will be seen by the papers published in this Report, the Second Annual Meeting of the Museums Association was of an essentially practical character, the subjects considered and discussed bearing more especially on the practical and technical work of Museums. Two points of cardinal importance raised at the Liverpool Meeting received the careful consideration of special committees during the past year and workable schemes have been suggested and adopted for dealing with both questions. The questions considered were—(i.) a method for getting specimens correctly named, and (ii.) a uniform and satisfactory method of labelling. It is to be hoped that the schemes proposed will receive the hearty support of Museum Managers and Curators. The benefit that would result if all the collections in the Kingdom were accurately named and instructively labelled is too obvious to need comment, and this, it is hoped, will be done by carrying out the systems suggested in the Reports of the Label and Specialist's Committees printed at the end of this Volume. Curators are particularly desired to peruse these Reports and to acquaint the editors with their views on the subjects.

The local arrangements were of the most satisfactory nature, and the Association is much indebted to several prominent members of the University for kind help and friendly hospitality. Conspicuous amongst these were the President (Mr. J. W. Clark, Registrary of the University) and Professor A. Newton. The Association also owes very much to Mr. S. F. Harmer, the local Secretary and Treasurer, to whose untiring energy the success of the meeting was largely due. Professor Macalister, Baron von Hügel, Mr. A. E. Shipley, Mr. James Carter, Professor Lewis, Professor Middleton, and Mr. Chapman gave much kind and useful help.

The main business of the meeting was the reading and discussion of papers, but a very important feature consisted of the visits paid to several Cambridge Museums and libraries, visits which were additionally instructive from the excellent guidance under which they were made. It was very encouraging to all engaged in Museum work to see the great importance attached to Museums in connection with the University teaching, as was evidenced by the extensive and magnificent buildings that had been erected for Museum purposes and the vast collections that had been got together. Excellent opportunities were afforded for the social intercourse of the members; we must especially mention a Reception and Soirée given by the President at Trumpington House where the most tasteful and agreeable surroundings rendered this intercourse doubly pleasant.

In this Report will be published the papers read at the meeting and the discussions on those papers and also a brief record given of other business transacted. In addition to this, queries relating to museum work will be printed at the end of the Report. Replies to these should be sent to one of the Editors who will, in the first instance, communicate them direct to the querist and afterwards print them in the next issue of the Report should they prove of general interest.

MUSEUMS ASSOCIATION RULES.

Adopted at the Liverpool Meeting.

1.—That this Association shall be called the "MUSEUMS ASSOCIATION," and shall consist of representatives of the Museums situated in the United Kingdom, and of other persons engaged in scientific work or interested in Museums, who may be admitted as Associates.

2.—The object of the Association shall be the promotion of better and more systematic working of Museums throughout the Kingdom. In order to promote a better knowledge of Museums, the Association shall meet in a different town each succeeding year.

3.—That each Museum contributing not less than one guinea a year be a Member of the Association, and that individuals interested in the scientific work be admitted as Associates on payment of 10s. 6d. annually.

4.—That each Museum be represented by three delegates, each having one vote. Each Associate to have one vote.

5.—That each Museum belonging to the Association and each Associate receive one copy of the publications of the Association.

That the affairs of the Association be managed by a Council consisting of a President, two Vice-Presidents, two Secretaries, a Treasurer and eight ordinary Members. Three to constitute a quorum. All past Presidents to be *ex-officio* members of Council. The President, Vice-Presidents and two ordinary Members of Council to retire each year and to be ineligible for re-election for one year.

7.—The Council to be elected at the Annual General Meeting, and to hold office for one year. The Council shall have power to fill any vacancies that may occur in its ranks between Annual Meetings.

8.—That a General Meeting of the Association be held annually, for the transaction of business, the reading of papers, and the discussion of matters relating to Museums.

9.—The place and time of the Annual Meeting to be determined by the Council.

10.—All new rules, and all resolutions affecting existing ones, to be submitted to the Annual General Meeting. One calendar month's notice to be given of all resolutions affecting the rules.

Officers and Council of the Museums Association.

PRESIDENT.

J. WILLIS CLARK, M.A. (Registrary of the University of Cambridge).

PRESIDENT-ELECT.

PROFESSOR W. BOYD DAWKINS, M.A., F.R.S

VICE-PRESIDENTS.

THE REV. H. H. HIGGINS, M.A.
S. W. NORTH, F.G.S.

TREASURER.

ALD. W. H. BRITTAIN, J.P.

SECRETARIES.

T. J. MOORE, Cor: M.Z.S.
H. M. PLATNAUER, B.Sc.

COUNCIL.

R. CAMERON, J.P.
E. HOWARTH, F.R.A.S.
W. E. HOYLE, M.A.
J. PATON, F.L.S.
F. W. RUDLER, F.G.S.
DR. R. F. SCHARFF, B.Sc.
LIEUT.-COL. H. TURNER, J.P.
BUTLER WOOD.

EDITORS OF THE JOURNAL.

E. HOWARTH, F.R.A.S.
H. M. PLATNAUER, B.Sc.

SPECIALISTS' COMMITTEE.

J. W. CARR.
E. HOWARTH.
J. PATON.
F. W. RUDLER.
H. M. PLATNAUER.

LABEL COMMITTEE.

R. CAMERON.
J. W. CARR.
W. E. HOYLE.
E. HOWARTH.
H. M. PLATNAUER.

List of Museums and Associates belonging to the Association.

(Museums represented at the Cambridge Meeting are followed by the names of their representatives.)

Barnard Castle (Bowes Museum).
Blackburn.
Bolton.
Bootle: *John Lyon; J. J. Ogle.*
Bradford: *Butler Wood.*
Brighton.
Cardiff: *John Storrie.*
Dundee.
Glasgow: *Councillor P. Burt; J. Paton.*
Hereford.
Hull.
Liverpool; *The Rev. H. H. Higgins; R. Paden.*
Maidstone.
Manchester (Queen's Park).
Manchester (Owen's College): *W. E. Hoyle.*
Northampton.
Nottingham: *G. B. Rothera; J. W. Carr.*
Saffron Walden: *Joseph Clark; G. N. Maynard.*
Salford.
Scarborough.
Sheffield: *Ald. W. H. Brittain; E. Howarth.*
Sheffield (Ruskin Museum).
Southampton: *T. W. Shore.*
Stockport: *Lieut.-Col. Turner; John Tym.*
Sunderland: *R. Cameron; J. M. E. Bowley.*
Warrington: *Chas. Madeley.*
Worcester.
York: *H. M. Platnauer.*

Colombo.
Otago.

ASSOCIATES.

(The names of those present at Cambridge are printed in italics.)

F. A. Bather, B.A.
Montagu Browne, F.G.S.
Professor Flower, C.B., F.R.S.
Thos. Greenwood.
Professor T. McKenny Hughes, M.A., F.R.S.
A. B. Meyer, Ph.D. (Dresden).
F. W. Monks.
Spencer Perceval.
Miss Phipson.
F. W. Rudler, F.G.S.
A. Smith Woodward, F.G.S.

LOCAL ASSOCIATES.

The PRESIDENT.
J. G. Adami, M.A., M.B.
Rev. E. Atkinson, D.D. (*Master of Clare College*).
C. C. Babington, M.A., F.R.S. (*Professor of Botany*).
W. Bateson, M.A.
J. Carter.
E. Carver, M.D.
G. Cunningham, M.A.
F. Darwin, M.A., F.R.S.
A. H. Evans, M.A.
Rev. T. C. Fitzpatrick, M.A.
M. Foster, M.A., Sec. R.S. (*Professor of Physiology*).
Rev. P. Frost, Sc.D., F.R.S.
H. Gadow, M.A.
W. Gardiner, M.A , F.R.S.
W. H. Gaskell, M.D., F.R.S.
S. F. Harmer, M.A.
S. J. Hickson, M.A.
A. Hill, M.D. (*Master of Downing College*).
Baron A. von Hügel, M.A.
A. S. Lea, Sc. D., F.R.S.
W. J. Lewis, M.A. (*Professor of Mineralogy*).
J. J. Lister, M.A.
A. Macalister, M.D., F.R.S. (*Professor of Anatomy*).
J. H. Middleton, M.A. (*Professor of Fine Art*).
H. F. Newall, M.A.
A. Newton, M.A., F.R.S. (*Professor of Zoology and Comparative Anatomy*).
J. S. Reed, Litt. D.
A Sedgwick, M.A., F.R.S.
D. Sharp, M.B., F.R.S.
A. E. Shipley, M.A.
L. E. Shore, M.D.
A. Shrubbs.
C. Warburton, B.A.

PROGRAMME OF THE CAMBRIDGE MEETING, 1891.

LOCAL COMMITTEE.

CHAIRMAN—THE PRESIDENT.

C. C. BABINGTON, M.A., F.R.S. (*Professor of Botany*).

SIR G. M. HUMPHREY, M.D., F.R.S. (*Professor of Surgery*).

A. NEWTON, M.A., F.R.S. (*Professor of Zoology and Comparative Anatomy*).

T. M'K. HUGHES, M.A., F.R.S. (*Professor of Geology*).

W. J. LEWIS, M.A. (*Professor of Mineralogy*).

J. H. MIDDLETON, M.A. (*Professor of Fine Art and Director of the Fitzwilliam Museum*).

A. MACALISTER, M.D., F.R.S. (*Professor of Anatomy*).

BARON A. VON HÜGEL, M.A. (*Curator of the Museum of Archæology*).

D. SHARP, M.B., F.R.S. (*Curator in Zoology*).

J. J. LISTER, M.A. (*Assistant to the Superintendent of the Museum of Zoology*).

W. GARDINER, M.A., F.R.S. (*Fellow of Clare College*).

S. J. HICKSON, M.A. (*Fellow of Downing College*).

W. BATESON, M.A. (*Fellow of St. John's College*).

A. E. SHIPLEY, M.A. (*Fellow of Christ's College*).

H. A. CHAPMAN, (*Senior Assistant at the Fitzwilliam Museum*).

SECRETARY AND TREASURER.

S. F. HARMER, M.A. (*Fellow of King's College*).

TUESDAY, JULY 7th—

12 noon. Reception-room open. [Lecture-room of Zoology and Comparative Anatomy, New Museums].

8-30 p.m. President's Address in the New Lecture-room for Human Anatomy and Physiology, New Museums.

9-30 p.m. Reception and Soirée in the new Museum buildings.

WEDNESDAY, JULY 8th—

10 a m. to 12-30. Reading and discussion of the following papers :—

"On some old Museums," by PROF. A. NEWTON, M.A., F.R.S.

"On the desirability of exhibiting, in Museums, unmounted skins of birds," by the REV. H. H. HIGGINS, M.A.

"On difficulties incidental to Museum demonstrations," by F. W. RUDLER, F.G.S.

"On the Dresden Museum cases," by DR. A. B. MEYER.

The Honorary Treasurer's Report.

The Report of the Committee appointed to consider the question of securing the aid of specialists.

1-30 p.m. Luncheon at the University Arms Hotel.

3 p.m. Visit to objects of interest in Cambridge (starting from the Reception-room).

5 p.m. Service in King's College Chapel.

5-45 to 7 p.m. Garden Party in Christ's College Fellows' Garden.

THURSDAY, JULY 9th—

10 a.m. to 12-30. Reading and discussion of the following papers :—

"On the registration and cataloguing of Specimens," by W. E. HOYLE, M.A.

"Some recent Museum legislation," by E. HOWARTH, F.R.A.S.

"On the arrangement of Rock Collections," by H. M. PLATNAUER, B. Sc.

"On Tables and Chairs," by F. A. BATHER, M.A., F.G.S.

"Fossil Crinoidea in the British Museum" (an attempt to put into practice modern ideas of Museum arrangement). by F. A. BATHER, M.A., F.G.S.

The Report of the Committee appointed to consider the question of labelling in Museums.

1-30 p.m. Luncheon at the University Arms Hotel.

2-30 to 6 p.m. Visits to University Museums and Laboratories, and to Ely Cathedral.

9 p.m. Reception and Soirée given by the President at Scroope House, Trumpington Street.

FRIDAY, JULY 10th—

10 a.m. Visit to the Fitzwilliam Museum and to the Museum of Archæology.

Business.

Minutes of Meeting held July 8th and 9th.

The Honorary Treasurer (Mr. Ald. W. H. Brittain) read his report on the financial condition of the Association, which he considered very encouraging. The cash in hand amounted only to £0 13s. 2d., but with outstanding subscriptions and amounts due for advertisements the balance in hand was £5 0s. 2d.

Mr. Councillor Burt moved the adoption of the report. Mr. Butler Wood seconded the proposal, which was carried unanimously.

The Honorary Treasurer then asked for Auditors to be appointed. Mr. J. J. Ogle and Mr. C. Madeley were appointed Auditors.

Mr. Cameron moved "That the Council of this Association be requested to petition Parliament that the teaching of Natural History be made compulsory in all elementary schools."

Mr. Higgins seconded the motion. which was, after much discussion, put to the meeting and lost by 12 votes to 7.

Mr. Shore moved "That the Council of this Association be requested to issue a circular to County Councils recommending assistance to Museums under the Technical Education provisions of the Customs and Excise Act, 1890."

Mr. Paton seconded the motion, which was carried.

Mr. Howarth read the Report of the Label Committee.

Mr. Madeley moved the adoption of the Report, and this motion, seconded by Mr. Butler Wood, was carried.

(The Report is printed at the end of the Proceedings).

Mr. Platnauer read the Report of the Committee appointed to consider the question of securing the aid of Specialists. On the proposal of Mr. Cameron, seconded by Lieut.-Col. Turner, the Report was adopted.

(The Report is printed at the end of the Proceedings).

The President submitted to the meeting the list of Members of Council proposed by the outgoing Council. On the motion of Mr. Carr, seconded by Mr. Shore, this list was voted for "*en bloc*," and unanimously approved.

BALANCE SHEET.

	£	s.	d.
To Cash—Towns (28)	29	8	0
,, Associates	6	6	0
,, Advertisements	6	12	0
,, Sale of Annual Reports ..	0	16	6
,, Bank Interest..	0	5	6
Outstanding— £ s. d.			
Towns (3) .. 3 3 0			
Advertisements 1 4 0			
£4 7 0			
	£43	8	0

	£	s.	d.
By Secretary—Expenses, Stationery, Printing, Postage, &c.—(Mr. Platnauer)	16	14	7
,, Postage of Reports, &c. (Mr. Howarth)	1	15	5
,, Printing Reports, &c.	24	2	6
,, Bank Cheque Book	0	2	1
,, Bank Commission	0	0	3
,, Balance in the Bank	0	13	2
	£43	8	0

Audited and found correct, July 8th, 1891.

CHARLES MADELEY.
JOHN J. OGLE.

GENERAL PROCEEDINGS.

THE REV. H. H. HIGGINS, as retiring President, opened the proceedings. He briefly pointed out the advantages of Cambridge as a meeting place, and congratulated the Association on being able to meet in that city. After a few words on the changes that had taken place in the University since he took his degree there, he introduced the President elect, MR. J. WILLIS CLARK.

THE PRESIDENT'S ADDRESS.

GENTLEMEN OF THE MUSEUMS' ASSOCIATION,

It is customary, I believe, that the Address which a President inflicts upon the body over which he is called to preside should be more or less grave and formal. I will try to do my duty in this respect; but, before I begin, let me address to you a few hearty words of welcome. The University of Cambridge, I take upon myself to assure you, is sincerely glad to see you here; for, as the permission to assemble in this room was granted by a Grace, as we call it, of the Senate in solemn conclave assembled, it is evident that the collective voice of the University has spoken in favour of this Meeting. For myself, I am not merely personally flattered by the honour you have done me in electing me to the responsible office of President; I am grateful to you for the compliment you have paid to my University in choosing it for the place of your second Meeting. The movement out of which the Museums' Association grew originated in the Provinces, not in London; and it was natural, therefore, that the first meeting should be held in Liverpool, which has long been celebrated for possessing what I have often heard described as "the best Museum out of London." Liverpool, however, though thus pre-eminent, is not the only large town that has won for itself a foremost place in that which, if I may adopt a Cambridge phrase, may

be called "the Museums tripos." Your selection therefore of Cambridge implies that the efforts of this University in the cause of scientific education have been appreciated, and that—without solicitation or suggestion on the part of anyone connected with Cambridge—you have deliberately turned to this ancient seat of learning, where science is, after all, only one out of many subjects of instruction, in preference to those large and populous centres where science holds an undisputed sway, and where, on that account, you might have expected to find more to interest you. I can only hope that you will not be disappointed in your present choice.

The subject of Museums may be approached from so many sides that I find myself hampered by a difficulty of selection, rather than by a dearth of topics on which to address you. For my own part, I prefer the practical to the ideal. I have a horror of vague generalities which, for the most part, serve no better purpose than to display the ingenuity of their inventor; and I venture to assume that this Association, composed as it is of persons engaged in practical duties, will be of the same mind as myself. I have therefore concluded that I shall best assist you in the purpose which has brought you to Cambridge if I give you a brief account of what you will find here in the way of Museums. You will then be better able to examine them for yourselves, and, if you do not find much to imitate, you will at any rate learn what to avoid.

The great development of Natural Science at Cambridge during the last quarter of a century has, not unnaturally, made many persons forget that what we see now is only an expansion of something that existed previously, that it is not of wholly modern growth, due to the imperious demands of the nineteenth century. I do not propose to weary you with a long historical essay, but I should like to lay before you a few facts in support of this assertion.

The art of healing is obviously one of the first to claim the attention of a community; and it appears among the studies of Cambridge from very early times. There are Statutes of the fourteenth and fifteenth centuries which prescribe the books to be

read, the number of years to be spent in study, and the dress to be worn by Bachelors in the Faculty. In 1540, just three centuries and a half ago, King Henry the Eighth founded the Regius Professorship of Medicine, with an endowment of £40 per annum; a sum which, poor as it sounds now, then represented handsome competence. It may be doubted whether the medical knowledge of those days was anything better than a series of aphorisms derived from the classical writers; but before long the practical study of Anatomy was to be introduced by a Cambridge man, first into his own University, and thence into England. This illustrious person was John Key, perhaps better known in the latinised form of his name, Caius, as Shakespeare has used it in *The Merry Wives of Windsor*. He was a student of Gonville Hall, in this University, and afterwards of the University of Padua, where he obtained the degree of M.D. in 1541. While residing at Padua he fortunately lodged in the same house as André Vesale, the celebrated anatomist, from whom it is conceivable that he may have derived those ideas on the importance of anatomical investigation which he subsequently promulgated. On returning to England in 1544, he began to lecture on Anatomy; and there seems to be no doubt that we may fairly claim for him the credit of having been the first to do so. Subsequently, in 1557, he refounded the ancient college in which he had been educated, adding his own name to that of Gonville, as co-founder, and giving a new body of Statutes. In these the study of practical anatomy is specially enjoined, with many curious provisions for the reverent disposal of the body afterwards. In consequence of these provisions medical and anatomical science came to be regarded as the special province of Caius College—as it was soon denominated, to the exclusion of the original founder—but it was clearly studied elsewhere, for a human skeleton, enclosed in a case of oak, fitted with a glazed door, is still to be seen in the libraries of seven out of the sixteen original colleges, evidently a relic of the days when lectures had been given on that subject. Moreover, private dissections of the lower animals seem to have been the fashion, and the nickname of "dog-flayer" was given to those who pursued them. I have found

a curious description of one of those enquirers into Comparative Anatomy in the middle of the seventeenth century, in the Life of Mr. Matthew Robinson, of St. John's College. It quaintly anticipates modern investigations. "In anatomy he was the most exquisite inquirist of his time, leaving no anatomist unread, nor secret unsearched, insomuch that he was invited by some learned persons in other colleges, many years his senior, to shew them vivi-disections of dogs and such like creatures in their chambers, to whom he shewed the whole history of the circulation, the *venæ lacteæ*, the cutting of the recurrent veins in the neck with many experiments then novel, to great satisfaction, and no augur ever was more familiar with bowels than he, every week having some singularity or other of this nature to search in. Insomuch that one morning having been busy in his chamber with anatomising a dog, and coming to dinner into the college hall, a dog there smelling the steams of his murdered companion upon his clothes, accosted him with such an unusual bawling in the hall, that all the boys fell a laughing, perceiving what he had been a doing, which put him to the blush."

Until the beginning of the eighteenth century the Regius Professor of Physic was expected to provide what teaching of Anatomy was required, but in 1707 the University founded a separate Professorship in that Science. Five years earlier a Professorship in Chemistry had been established; and in 1716 the two Professors were allowed to share a University building opposite to Queens' College, which had been built in 1696 for a printing-house. I cannot describe this building to you from personal recollection, for it was destroyed before I was born; but I have heard it described as small, ill-lighted, and inconvenient. Still, it is not without interest, as having contained the first Laboratory and the first Museum of the University of Cambridge. The tiny lecture-room is figured by Ackermann; and there, and in a small room adjoining it, the study of Anatomy was prosecuted until 1833. An extensive collection was gradually accumulated; for Sir Busick Harwood, Professor from 1785 to 1814, was fond of Comparative Anatomy, lectured on it, and left a large series of preparations

behind him, which were bought after his death for the University. Some of these, beautiful mercurial injections, are still in existence. Harwood may be fairly claimed as the founder of the existing Museum. In 1833 the building now spoken of as the old Anatomical Museum was erected; and there, up to 1862, the collections of Human Anatomy, and of Zoology and Comparative Anatomy, were preserved together. Let us leave them there for a few moments, while I say a few words on the way in which the other Natural Sciences came to be recognised in Cambridge, taking them in the order in which their Professorships were established.

The Professorship of Botany was established in 1724—due to that movement for scientific instruction which distinguished the first quarter of the last century. The first Professor, Richard Bradley, I will pass over in silence; but his immediate successors, John Martyn, and his son Thomas Martyn, were men of distinguished ability, who attracted students to their lecture-room, and convinced the University of the importance of their subjects. John Martyn (who died in 1733), bequeathed to the University his collections, and some 200 volumes of Botanical works. Both these gifts are carefully preserved—the nucleus of the present extensive Botanical Museum. During the tenure of office of Thomas Martyn—who was Professor of Botany for sixty-four years—the principal portion of the ground on which these Museums and Lecture-Rooms stand was purchased by Dr. Walker of Trinity College, to be laid out as a Botanic Garden. Martyn was the first reader; and in the first lecture delivered by him in that capacity he is said to have introduced the novelty, as it then appeared, of the Linnean System. In 1784—the garden having been purchased in 1760—a lecture-room was constructed for the use of the Botanical and Jacksonian Professors. The latter Professor, I should mention by the way, had been appointed in the previous year on a special foundation. This lecture-room still exists—the parent of a numerous progeny which has since sprung up in its immediate neighbourhood.

The Professorship of Geology was founded in 1728, by the Will of John Woodward, M.D. Early in life he had been led to

examine the structure of the crust of the earth; and being a man of no ordinary acuteness, had made several remarkable discoveries far in advance of the age in which he lived. He had recognized, for instance, that the shells found in a fossil state "are the real spoils of once living animals," and, had not his mind been predisposed to theory, he might have anticipated, by a century, the discoveries of William Smith. Moreover he was no mean Botanist, and as a Physician inaugurated certain novelties of treatment which were perhaps not quite so extravagant as his enemies would have us believe. On his death, he bequeathed his collection to this University, and founded a lectureship. It was to be the duty of the lecturer to "read at least four lectures every year, at such times, and in such place of the said University, as the majority of the electors shall appoint, on some one or other of the subjects treated of in my *Natural History of the Earth*, my *Defence of it against Dr. Camerarius*, my *Discourse of Vegetation*, or my *State of Physick*, at his discretion." The lecturer, however, has uniformly confined his lectures to Geology. The collection—which concerns my present purpose more than the other provisions of Dr. Woodward's Will—consists of a large and important series of English fossils, collected by himself; with an almost equally large series of foreign fossils, which he had obtained by purchase or through friends. These latter were bought by the University after his death for one thousand guineas. Dr. Woodward's specimens are still to be seen, preserved with affectionate care in the cabinets in which he himself placed them. As the Museum of Geology has, unfortunately, been always divorced from the other Museums of Science—an unnatural separation which, I hope, will not be much longer endured—I will complete what I have to say about it at once. The Woodwardian Collection is the nucleus of it; and, by way of commemorating Woodward's generosity, it is commonly spoken of as the Woodwardian Museum. But it owes its present development to the energy of Professor Sedgwick, who occupied the chair from 1818 to 1873. From the beginning to the end of his long tenure of office his principal object was the enrichment of his Museum. Nor has his successor, Professor

Hughes, neglected to follow in his steps. I can confidently recommend to you a careful examination of this Museum.

The Professorship of Mineralogy was conferred in 1808 on the celebrated Edward Daniel Clarke, who had given lectures on the subject which had been enthusiastically received. His collections, which were very extensive, and full of beautiful specimens, were purchased after his death for £1,500. I specially commend to your notice this Museum; it was arranged by the late Professor Miller in cases copied from those in use at the École des Mines, Paris.

I have now enumerated the Professorships founded previous to the direct encouragement given to Natural Science in this University by the establishment of the Natural Sciences Tripos, the first examination for which was held in 1851. I have purposely omitted the two Professorships in Astronomy, because they have nothing to do with Museums. Let me briefly recapitulate the rest.

{ Regius of Physic, 1540.
{ Anatomy, 1707.
{ Chemistry, 1702.
{ Jacksonian, now of Chemistry, 1783.
Botany, 1724.
Geology, 1727.
Mineralogy, 1808.

The holders of these chairs were, for the most part, successful in attracting audiences at a time when, as I have just said, no direct encouragement was given to Science in our examinations, with the exception, I need hardly remind you, of those that led to the Medical Degree. Many instances might be quoted from Memoirs, Recollections, and similar publications, in proof of this. I will, for the present, content myself with citing the lectures of Dr. Watson, Professor of Chemistry, 1764—1773; of Mr. Willis, Jacksonian Professor, 1837—75; of Professor Martyn, who lectured on Botany "in the Spring of 1763 to fifty pupils, besides about as many more occasional hearers"; of Professor Henslow, who had crowded audiences; of Professor Sedgwick, whose class was always a large one, including many ladies; of Dr. E. D. Clarke,

whose knowledge of Mineralogy was said to be small, but whose power of imparting it was so charming, that he was never at a loss for hearers.

I have troubled you with all these details in proof of the position which I enunciated at the outset, that this University was a scientific school before the movement of our own time gave a new impulse to its efforts.

In 1862, the Botanic Garden having been removed to a new site, the buildings in a corner of which we are now assembled were begun; and accommodation, which was then thought to be sumptuous, was provided for Anatomy, Botany, and Mineralogy. In 1866, the Professorship of Anatomy was divided by the creation of a chair of Comparative Anatomy and Zoology. The Collections illustrative of the former subject remained, and still remain, in the old building, those illustrative of the latter in the new. Of the Collection which was removed into its new home in 1865 but little remains; the older skeletons with which my father had been compelled to content himself because better specimens could not in those days be obtained, have been replaced by others; and the whole has been largely increased. An extensive Invertebrate collection has been added, the most attractive and valuable specimens in which have been acquired from Dr. Dohrn, of Naples. Nor must I forget to draw your attention to the Foraminifera presented to us by our lamented friend, Dr. Brady.

At this point let me be allowed a brief digression.

Let me remind you in the first place that our Museums are essentially educational, and educational in a special sense. They are not intended for the general public, nor for advanced naturalists, but for beginners. Beginners, however, as their studies widen, demand more extensive collections; and, our space being limited, we have to consider how we can best accommodate our collections to the wants of those two classes of students, just as we have to consider, in our examinations, how we can test the qualifications of those who aspire to Honours, and of those who content themselves with an ordinary degree. It has been suggested that before long we shall have to arrange two separate Museums; one for

beginners, one for advanced students; and I think the suggestion well worthy of careful consideration. One thing at least is certain. It may be taken as a canon of Museum arrangement that it is far easier to exhibit too many specimens than too few.

I hope that you will find something to attract you in these collections. For the building I have no defence to offer, as I am compelled to confess that it sins against all sound canons of Museum construction. The experience I have gained since it was built has led me to conclude that Museums should be lighted by sky-lights, not by side-windows; and I very much doubt whether a single large room is so convenient for arrangement as a number of small ones. I should remark that some important changes are now in progress. The Invertebrates will shortly be removed to a gallery on the east side of the main building; and I hope before long to see the preparations of organs in spirit placed near the animals whose structures they illustrate. Why, let me ask, should the external characters of an animal be displayed in one room, its osteology in a second, and its organs in a third? And yet this is the system universally pursued in all the Museums with which I am acquainted.

Again, why do we still separate animals that are extinct from those that are still living on the globe? The great Cuvier, in his work entitled *Les Ossemens Fossiles*, published in 1812, just seventy-nine years ago, pointed out that fossil bones could only be understood by comparison with those of living animals, and prefaces his description of such remains by a disquisition on the living species of each group. And yet, disregarding the lesson taught by that great authority, and, more than that, disregarding the lessons of common sense, we still separate those specimens which happen to be fossilised from those which happen to be recent. I have good reason to speak with some authority on this subject, because the inconvenience that results from this slavish adherence to custom has been so frequently brought under my notice. The gravels in the immediate neighbourhood of Cambridge are full of the bones of elephant, rhinoceros, hippopotamus, and other large animals, usually in a very fragmentary condition.

These fragments are of necessity brought to the Museum of Comparative Anatomy for identification; but how much simpler it would be to have the Museum of Geology contiguous to that Museum, so that not only might much valuable time be saved, but the great lesson might be taught that life on the globe has not been interrupted, and that living forms cannot be separated, generically, from those that are extinct. I make these remarks to an Association such as yours, because I conceive that a great principle is involved in such an arrangement as I have indicated; a principle which my geological friends are too prone to ignore; but which I hope may be recognised and acted upon in new institutions, where established custom is not elevated into a divinity. In the Museum of Comparative Anatomy you will find a considerable number of extinct forms placed side by side with those that are recent: and I have selected some of the most attractive of these for exhibition in the room in which we hope that you will shortly assemble.

And now let me return to the point whence I diverged. At no great distance from the Museum of Comparative Anatomy, on the first floor, you will find the room in which our Ornithological collections are for the present bestowed. Against the west and north walls are cases containing a collection of British birds. The greater part of these belonged to the Cambridge Philosophical Society, by whom they were presented to the University in 1865. In the centre of the room are cases containing a general Ornithological collection. Here we have attempted to carry out the arrangement, on the absence of which in Museums I have just animadverted, namely, the juxtaposition of the stuffed specimen, the skeleton, and the most characteristic and interesting of the organs in spirit. I must leave it to you to criticise this attempt. In this room you will also find the Strickland collection of birds in skin, formed by the late H. E. Strickland, Esq., and presented by his widow in 1867; with a large general collection of bird-skins. I must draw your attention specially to the skeletons of the Great Auk, the Dodo, and the Solitaire. The skeletons of the latter bird were put together from a large series of bones dug up by

Sir Edward Newton in a cave at Rodriguez; and are, I am proud to say, the first attempts to reconstruct the bird since it became extinct in the seventeenth century.

The Department of Botany has been largely increased within these last few years by the erection of class-rooms for the teaching of Physiological Botany, and by the commencement of a Museum to which additions are being almost daily made. I invite your special attention to this, because I believe the attempt which is there going forward to be a novel one. A series of plants and portions of plants, in spirit, to shew special morphological peculiarities, is being gradually got together. They are displayed in two small rooms, now nearly full. The first contains Dicotyledons, Gymnosperms, Pterydophyta; the second Monocotyledons, Algæ, Fungi, Mosses.

My enumeration of our Museums ends here. There are, however, other buildings to which I wish to draw your attention. The first of these is the Cavendish Laboratory, erected between 1872 and 1874, by His Grace the Duke of Devonshire, our Chancellor, for research in the Department of Experimental Physics. In 1882, a Laboratory in Animal Morphology was built, for the use of Mr. Balfour, for whom a chair in that science had been established. Mr. Balfour, unfortunately, did not live to see this Laboratory finished; but his work was carried forward so efficiently by his friend and pupil, Mr. Sedgwick, that it was found necessary, in 1884, to add a second Laboratory to the first. This was effected by raising the roof of the Museum of Mineralogy, and at the same time carrying up the walls. And here let me remark, by the way, that we have reaped much advantage by the prudent foresight of those who planned these buildings in the first instance. They chose a simple style—I have even heard it called a mean style—and they planned their work in such a way that it can be readily altered. Now in this, I maintain, they acted wisely. I hold it to be impossible, in the changing requirements of modern science, to decide, at any given moment, what may be required in a few years' time; and I recommend to all who have to plan a complex range of buildings for the accommodation of

different sciences, to select a plan which can be readily altered and extended, and a style which will admit of such changes without those who suggest them being accused of profane interference with an artistic masterpiece.

In 1883, a Professorship in Physiology was established; and Mr. Michael Foster, who, as Trinity Professor in Physiology, had taught Physiology in these buildings since 1870, was appointed to the chair. A laboratory was completed for his use in 1879, which has since been increased by the addition of a range of buildings, the occupation of which is now beginning. We shall shortly assemble in the principal class-room of this addition.

In the same year, 1883, a Professorship of Pathology was established; and in 1887, when the new Chemical Laboratory was completed, a Pathological Laboratory was contrived by alteration of the old Chemical buildings--themselves an extension of the first building erected here, as I mentioned above, in 1784. This Laboratory is, I believe, fairly complete in all its requirements.

The new buildings for Anatomy were ready for use at the beginning of the present year, 1891. They will contain, when completed, a Museum of Human Anatomy, into which part of the collections now to be seen in the old building will be transferred. I think you will find the arrangements worth your inspection.

The Department of Mechanism is, for the present, housed in buildings of a temporary character. Their entrance is opposite to the Cavendish Laboratory. They were begun in 1877, under the auspices of Professor Stuart, whose personal popularity, and attractive method of imparting knowledge, drew together a large number of pupils. At the present time the accommodation is being increased by the addition of a large building lately used as a school; and Professor Ewing, Professor Stuart's successor, is not without hope of developing a school of engineering in Cambridge, on the model of those so successfully established elsewhere. But, I regret to say that funds are wholly wanting, and that, unless we can obtain help from outside, we shall be unable to realise these noble designs. It would ill become me to turn this address into a charity sermon; but I cannot let this opportunity go by

without stating that the wealth with which the University of Cambridge is credited exists only in the imagination of those who speak of it; and that we experience every year considerable difficulty in performing successfully that financial operation called "making two ends meet."

Before I conclude this part of my address, I should like to say a few words on some other Museums, not forming part of these buildings, but in which I feel sure you will find a good deal to study and, I hope, to admire. The first of these is the Fitzwilliam Museum, so called from the donor, Richard, Viscount Fitzwilliam, who bequeathed his entire collections to the University in 1816. The building in which they are contained was commenced from the designs of George Basevi, Architect, in 1837. Since that time the building has been finished, and the collections largely augmented by donations and by purchase. You will find there a respectable collection of oil-paintings—and a really fine collection of engravings, wood-cuts, and etchings. As a piece of architecture, the building will, I feel sure, command your admiration; but I am doubtful whether you will approve of it as a receptacle for works of art. The lighting—the first requisite for a good Museum—appears to me to be defective; and the style selected renders extension impossible. In fact, when it was found necessary a few years ago to establish a Museum of casts, we were obliged to build on a piece of ground at some distance from the parent building. Here you will find a well-selected series of casts, illustrative of the history of sculpture, displayed in galleries which are plain—and not wholly free from certain defects—but which at any rate are well lighted.

Adjoining this is the Museum of General and Local Archæology, to which I invite your special attention. It contains (1) the collections formerly belonging to the Cambridge Antiquarian Society; and (2) an important and daily increasing collection illustrative of Comparative Ethnology.

In the former series you will find a number of articles of great interest found chiefly in Cambridgeshire, as flint implements, bronze axes and arms, an extensive series of pottery and glass,

and various antiquities, illustrating the history of the Town and University. The latter series comprises a singularly beautiful collection of arms, household utensils, idols, and sacrificial utensils, chiefly from the South Sea Islands. These I confidently commend to your attention. The bulk of them were collected in Fiji by Sir A. Gordon, Mr. Maudslay, and Baron A. Von Hügel, who is now Curator of the Museum, and has deposited in it the whole of his private collection. Moreover, large additions have been made by purchase, as occasion presented itself. I need not enlarge upon the importance of such a collection as this, especially when placed side by side with the flints and bronzes found in our Fens. The one illustrates the other, and enables students to understand the use of what would otherwise be incomprehensible to them.

NOTES ON SOME OLD MUSEUMS,

BY

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Being in possession, more by chance than by choice, of a certain number of works of various dates relating to Museums, I have thought that I might be able to contribute to the amusement of the members of this Association during their stay in Cambridge by exhibiting some of the older of these books, and offering a few remarks on their contents. It is, however, with much diffidence that I venture to do this. I am wholly incompetent to trace the rise and progress of Museums; and indeed I suspect that their historiographer would have no easy task in attempting to lay before the world any connected account of them. One naturally looks to the ordinary sources of information when endeavouring to instruct oneself in a matter of this kind,—and the most ordinary source of information is naturally an Encyclopædia. I regret to say that herein my efforts have been most unsuccessful, and I think the result justifies the suspicion I have just expressed. The last edition, the ninth, of the "Encyclopædia Britannica" contains no article on Museums; and if you turn to the more recent and still unfinished Chambers's "Encyclopædia," you will find there little more than the time-honoured statement that the first Museum, the Μουσεῖον of Alexandria, was a building devoted to the cultivation of the Arts and Sciences, presided over by the nine Muses—ladies whose names we learnt as schoolboys, but ladies with whom, if we formed even a platonic attachment for them, we have never (I speak for myself) been passionately enamoured.

It seems to be a sort of accepted fact—at least it was accepted as a fact by the Director of the Natural History Department of the British Museum in the admirable address which he delivered two

years ago at Newcastle-on-Tyne, as President of the British Association, that one of the earliest Museums, in anything like the modern sense of the word, ever formed was that of JOHANN KENTMANN, of Dresden, and a catalogue of its contents was drawn up by the great Swiss naturalist CONRAD GESNER (whose own Museum cannot have been formed much later), which was printed at Zurich in 1565. A copy of this I am able to shew you,* and you will observe that it contains a woodcut representing the cabinet or "*Arca*," in which the worthy Dr. Kentmann comprised his treasures. It has the appearance of being a nice piece of carpentry, consisting of thirteen drawers of equal depth—though each drawer must have been divided, as it has two numbers,—which were pulled out by an ordinary ring-bolt, and closed by a door, while it stood upon a substantial plinth, and had a rather heavy cornice and triangular pediment atop. The dimensions are not stated; but if we suppose that, for convenience sake, the top drawer was not more than five feet from the ground, we should have about four inches as the depth (outside measurement) of each drawer—for we must allow for the height of the plinth, which is equal to the depth of two drawers. On this supposition the drawers will be just two feet wide, and if the figure can be trusted they would seem to reach back as far. Thus we have a bit of furniture of no inconvenient size, and one that would be no obstruction in a room of modest dimensions. Some might smile at its smallness: for my own part, I am inclined rather to envy the man whose *cimelia* could be contained within such compass; but I am bound to tell you that these *cimelia* professedly consisted only of what were then called "Fossils"—that is to say, anything not living that was dug out of the ground—earths, such as clay and sand, salts, gems, marbles, rocks, and metals—in a word, minerals of every kind, to say nothing of organic remains, such as corals and shells, some of which were straight out of the sea; and, in addition, eggs of the Dog-fish, and even a dried *Hippocampus*, to say nothing of

*De omni rervm fossilivm genere, gemmis, lapidibvs, metallis, et hvivsmodi, libri aliqvot, pleriqve nvnc primvm editvm. Operâ Conradi Gesneri: Quorum catalogus sequens folium continet. Tiguri: 1565.

calculi or stones formed within living beings. It is probably owing to the inland situation of Torgau, where Kentmann lived, that his collection did not include more shells; for as every one knows, no specimens of natural history are more easily preserved, while their beauty, whether of colour or form, makes them objects especially worthy of admiration. It is not surprising to find that the earliest collections formed consisted of things which could be kept with little or no treatment, for as yet there were few ways known of preserving anything of a perishable nature. I have no doubt that at the time of which I am speaking, or even earlier, collections of dried plants had been begun; but I am unfortunately no botanist, and would hazard no more definite opinion on that point. It is well known that the first botanists were what we now call "herbalists," and it is notorious that herbalists form collections of dried plants, even if these do not attain the dignity of a *hortus siccus*. It is true that the furrier's art is an ancient one, and that mankind seems at an early period to have devised means of preserving the skins of beasts with their hair on, that they might clothe themselves therewith; or even, in later ages, when the need of such kind of protection was not so pressing, that they might keep the spoils of the chase as trophies—recollections of a good day's sport. You will remember Walter Scott's lines describing the interior of a hunting lodge:—

> "There grinned the wolf as when he died;
> And there the wild cat's brindled hide
> The frontlet of the stag adorns,
> Or mantles o'er the bison's horns."

But our first predecessors in the Museum way of business seem not to have taken this hint, and nearly a century passed before we have any evidence that such specimens as now attract the greatest amount of notice in a modern Museum were stored and exhibited. OLAF WORM, Regius Professor of Medicine in the University of Copenhagen, who was 66 years of age in the year 1654, was the first I know who formed a Museum that contained such objects as I have just mentioned, and the catalogue of his collection, published at Leyden by his son in the following year, shews that it had attained

respectable dimensions. This, the "Museum Wormianum,"* not only contains, as you will see, a fine portrait of its founder, but also, as frontispiece, a view of the interior of the apartment—for it had far outgrown the dimensions which had been sufficient to accommodate the modest collection of Kentmann ninety years before. If you look at this copperplate engraving I think you—or some of you at any rate—will find that it calls to mind the Museums which used to exist in many an English county-town not so very long ago, and perhaps may exist still. The stuffed Shark, Sturgeon, and Polar Bear hanging from the ceiling, the Deers' horns, savage weapons, dried Crocodiles, Tortoise-shells, and Armadillo arrayed on its walls, supported by shelves, on which rest many more things—most of them clearly recognizable—than I have time to mention; the floor encumbered by Whales' bones, a model Greenlander and goodness knows what beside—all these are so like what I, in my younger days, have seen in more than one provincial Museum, that I cannot doubt the veracity of the view. I will only direct your attention to one object which is not often seen in a provincial Museum, and that is an unmistakable *Alca impennis*, which you will perceive standing on the top shelf on your right hand between a King-Crab and the beak of a Saw-fish; and if you will turn to the text (page 301) you will find a full length portrait of a specimen of that extinct species, which was sent to Worm from the Færoes, and kept alive by him for some time.

The year after the publication of the "Museum Wormianum," there appeared in London a book of diminutive size compared with the stately Dutch folio, but one to Englishmen of still greater interest. This was the "Musæum Tradescantianum: or a Collection of Rarities. Preserved at South-Lambeth neer London;" † which seems to have been the first thing of the kind ever formed or exhibited in this country; and, though the book itself may not be common, everybody

* Museum Wormianum. Seu Historia rerum rariorum, tam naturalium, quam artificialium, tam domesticarum, quam exoticarum quæ in Hafnia Danorum in Œdibus Authoris servantur, Adornata ab Olao Worm, Med. Doct. &, in Regiâ Hafniensi Academiâ, olim Professore publico. Variis & accuratis Iconibus illustrata. Lugduni Batavorum: 1655.

† London: 1656.

interested in Museums knows of the TRADESCANTS, father and son, yet no one seems to know much about them; and we regard their portraits engraved by Hollar, as given in this little book, with feelings of veneration, as the parents of British Musæology (if I may invent such a word). The little that is recorded of them may be read in many books; and I need only remind you that the elder JOHN TRADESCANT seems to have been a Hollander; that as a young man he had travelled in Europe and Asia—by which last term I suppose Asia Minor alone to be intended; that in 1629 he was appointed gardener to King Charles I., and seems to have lived till about 1650. The younger JOHN voyaged to Virginia, returning with a collection of seeds and dried plants; but he fully inherited his father's passion, and moreover, published this catalogue of the Museum. In his prefatory address "To the Ingenious Reader" he says that—"About three yeares agoe (by the perswasion of some *friends*) I was resolved to take a *Catalogue* of those *Rarities* and *Curiosities* which my *Father* had scedulously *collected*, and my *selfe* with continued diligence have *augmented*, & hitherto *preserved* together: They then pressed me with that Argument, *That the enumeration of these Rarities, (being more for variety than any one place known in* Europe *could afford) would be an honour to our Nation, and a benefit to such ingenious persons as would become further enquirers into the various modes of Natures admirable workes, and the curious Imitators thereof.*" Did time permit, I would gladly go over this little book page by page, for I believe there is hardly a leaf but would furnish the text for a sermon; but I must forbear. Even the very first is to me tempting, for it begins with "Egges," of which the Cassawary or Emeu, Crocodiles and Estridges, stand at the head; and then we have Soland-goose and Squeedes—these last being young Gannets, dried to serve as a "whet" to the appetite—and "Divers sorts of Egges from Turkie: one given for a Dragon's egge," followed by "Easter Egges of the Patriarchs of *Jerusalem*." But I must not linger over these things—even "Two feathers of the Phœnix tayle," and "The claw of the bird Rock; who, as Authors report, is able to trusse an Elephant," I must leave to your imagination. One of the most instructive things in this little book is

a list of the "Principall Benefactors to the precedent Collection." This is headed by the name of King Charles I. (whom we know to have been as great a patron of learning and art as his successor was of science) and his Queen; and then follow those of various titled persons of more or less distinction, till we come to a roll of still greater names—Sir Thomas Roe, Sir Christopher Hatton, Sir Henry Wooton, Sir Kenelme Digby, Sir Nathaniel Bacon, Sir Dudly Diggs, Sir Henry Vane, Sir Clipsby Crew, Sir John Smith, Mr. Thomas Herbert, and ELIAS ASHMOLE, Esq., among others. With the last named, John Tradescant the younger became acquainted in 1650, and so great a friendship sprung up between them that he left Ashmole his heir, and this last bequeathed the Museum to the University of Oxford, where what remains of it, including the head and foot of the Dodo (saved from the fire which consumed the rest of the specimen), may still be seen.

I have next to call your attention to the "Gottorffische Kunst-Kammer," a catalogue of which was compiled, and seems to have been first printed in 1666. I never saw a copy of that edition; but here is one printed not many years later, at Sleswick in 1674.* The author of it was ADAM OLEARIUS, Librarian and Antiquary at the Castle of Gottorff or Gottorp, in those days the residence of the Prince or Duke of Sleswick, which stands on an island in the fjord or bay of Flensborg. Here the title page shews us the doorway of this Museum, whence we have a peep into the interior, shewing a passage and at least three rooms, the first of which is fitted with tables covered by drapery, on which various shells are displayed, while against the wall are placed some Egyptian statues, a Russian *icon*—being a picture of Saint Nicholas, what appears to be a huge Chamæleon over one of the doors, and some dried marine monsters,—I am at loss to say whether they be Fishes, Cetaceans or Pinnipeds—perhaps there is one of all three

* Gottorffische Kunst-Kammer, worinnen allerhand ungemeine Sachen. So theils die Natur, theils künstliche Hände hervor gebracht und bereitet. Vor diesem aus allen vier Theilen der Welt Zusammen getragen, und vor einigen Jahren beschreiben, aüch mit behörigen Kupffern gezieret durch Adam Olearium, Weil. Bibliothecarium und Antiquarium auff der Fürstl. Residentz Gottorff. Anjetzo aber übersehen, zum andern mal gedruckt. Schlesswig: 1674.

groups. There is also a Rhinoceros horn and the tusk of a Narwhal. But more of the contents of the Museum you may learn from the copper plates, of which there are 37, while the subjects of the figures are explained in the text of the book. Many of the figures, however, do not represent specimens in the Museum, but are copied from others, and most of them from well known works. Olearius wished the Museum under his charge to be instructive, and as an instance of that I may say that he explains (pp. 8, 9) that the animals figured on Plate VIII. are to represent the four Elements—Earth being personified by a Scinc or Egyptian Lizard; Water by a Pipe-Fish, Air by a Chamæleon, and Fire, of course, by a Salamander. In other places he moralizes to an extent which is rather prosy, and I will abstain from quoting him. In the course of years the successors of his Master, Christian Albrecht, Prince and Duke of Sleswick, became King of Denmark, and this Museum was removed to Copenhagen. There I have seen at least one specimen which belonged to it, the beautiful Dodo's skull, which, having been lost sight of for about one hundred and seventy years, was found and recognized by my late good friend Prof. Johannes Theodor Reinhardt.

The next book I have to shew you is the "Museo Cospiano,"* being a catalogue of the collections formed by FERDINANDO COSPI, of Bologna, Marquess of Petriolo, and compiled by Lorenzo Legati, of Cremona, Professor of Greek in Bologna, and published there in 1677. This collection included that which had belonged to the celebrated Naturalist, Ulysses Aldrovandus. Here again we have a view, and a large one, of the interior, but you will observe that the specimens of Natural History exhibited, are not so numerous in proportion as they have been in the Northern Museums on which I have before dwelt, but it is worth remarking that the "fossils" it contained included some geological specimens

* Museo Cospiano annesso a qvello del famoso Vlisse Aldrovandi e donato alla sua Patria dall'Illustrissimo Signor Ferdinando Cospi Patrizio di Bologna Senatore Cavaliere Commendatore di S. Stefano, Balì d'Arezzo e March. di Petriolo, fra'gli Accademici Gelati il Fedele, e Principe al Presente de' Medesimi. Descrizione di Lorenzo Legati Cremonese Dottor Filosofo, Medico, e Pubblico Professore delle Lettere Greche in Bologna, Accademico Apatista, e Ansioso. Bologna: 1677.

of importance. There was (p. 151) the tibia of an Elephant dug up in 1663 by the River Chiana in Tuscany, and we may well believe that this specimen may have helped the Italian geologists of that day to form those much more correct views of things than, as Sir C. Lyell so well shewed, were entertained by the scientific men of other countries.

I now come to a work that you will all know—NEHEMIAH GREW'S Catalogue of the Museum of the Royal Society, published in London in 1681,* though comparatively few people do know that the founder of that Museum was one Daniel Colwall, whose portrait forms a fitting frontispiece to this volume. I need not dwell upon this work, though of course it contains much that is of interest; but the illustrations leave much to be desired and shew the low state of the engraver's art at that time in this country. One matter only will I mention as particularly pertaining to our business and that is the Author's remarks (p. 58) on "A young LINET which being first embowel'd, hath been preserved sound and entire, in rectified Spirit of Wine, for the space of 17 years. Given by the Honourable Mr. *Boyl.* Who, so far as I know, was the first that made trial of preserving animals this way. An experiment of much use" as Grew goes on to say, for "preserving all sorts of Worms, Caterpillars and other soft Insects.....So also to keep the Guts, or other soft parts of animals fit for often repeated Inspections. And had the Kings or Physitians of *Egypt* thought on't, in my opinion, it had been a much better way of making an everlasting Mummy." Thus we seem to be indebted to Robert Boyle for what in these days we cannot imagine a Museum to exist without.

The next book I will lay before you is the Catalogue of the Museum formed at Copenhagen by King Christian V., of Denmark, and published there in 1696 by OLIGER JACOBÆUS.* It is of much the same character as those I have already shewn you, but as is

* Musæum Regalis Societatis. Or a Catalogue and Description of the Natural and Artificial Rarities belonging to the Royal Society and preserved at Gresham Colledge. Made by Nehemiah Grew, M.D., Fellow of the Royal Society, and of the Colledge of Physitians. Whereunto is subjoined the Comparative Anatomy of Stomachs and Guts. London: 1681.

natural it contains a good many Northern Antiquities, and among them the two magnificent drinking horns that are figured in it. One of these of pure and tried gold, 2 feet 9 inches long, and weighing 102½ oz., was found by a country girl on the 20th July, 1639, near the village of Œsterby in Denmark. I am not sure whether it is this or another that was subsequently found, which having been kept in the Museum of Copenhagen for many years was stolen therefrom in the early part of this century. The other is the magnificent *Cornu Oldenburgicum*, from its having been brought from Oldenburg, and it is certainly one of the finest specimens of mediæval workmanship to be seen anywhere. It is of silver, parcel-gilt or inlaid with gold, and weighs 61 oz. It is said to have been made by order of King Christian I., when at Cologne in 1447, to act as arbitrator between the Emperor Frederick III. and Charles the Bold, Duke of Burgundy; and, by that king dedicated in honour of the Three Kings, and the legend, "*Drinc all wt*," inscribed on the scroll borne by the female figure which surmounts the cover, shews the use to which it was applied.

A few years earlier than the work of Jacobæus, viz., in 1693, was begun the "Musei Petiveriani Centuria"—ten parts of which were published in London, the last in 1703, being quickly followed by the "Gazophylacii Naturæ et Artis" of which as many more appeared between 1702 and 1717; but there is no occasion for me to enter into particulars concerning this modest little work, nor will I take up your time in dwelling upon the "Amboinsche Rariteitkamer," containing a vast collection of corals, shells, and other marine productions procured from the Dutch possessions in the East Indies, which was formed by RUMPHIUS at Amsterdam, and of which the Catalogue was published in 1705, further than to remark that it included that Pearly Nautilus, which was for nearly one hundred and thirty years unique—until indeed Dr. George Bennett obtained the specimen which formed the subject of Sir R. Owen's well-known Memoir. Want of time also induces me

* Museum Regium seu Catalogus rerum tam naturalium, quam artificialium, quæ in basilica bibliothecæ augustissimi Daniæ Norvegiæq: Monarchæ Christiani Quinti Hafniæ asservantur, descriptus ab Oligero Jacobæo, Med. &.....Phil. Pref. Regio. Hafniæ: 1696.

to pass over without comment the "*Museum Kircherianum*," which included spoils from all parts of the world collected at Rome by the Members of the Order of Jesus, and was published in 1709, as well as what is known as the "*Thesaurus*" of SEBA, brought out at Amsterdam in four enormous folio volumes between 1734 and 1765, containing indeed a rich treasure, as the full title of the work rightly expresses. Nor need I describe to you the gradual formation of the collection of Sir Hans Sloane, which, at his death in 1753, was bought by the Nation, and became the foundation of the British Museum, which was opened as such in 1759, for the history of this grand institution may be found recounted in many works.

I have now to introduce to your notice a collection much larger than Sloane's, probably the largest ever formed by any one private person in this country; and one that, to the eternal disgrace of the authorities, was allowed to be dispersed without, I believe, any of its treasures being secured for the National Collection. This was the property of Sir Ashton LEVER, a Lancashire gentleman of old family long settled near Manchester. Begun by him in youth, it soon reached enormous proportions; and, though a man of large fortune, he found himself greatly embarrassed by his imprudence in buying everything that was offered for sale. To escape his difficulties his friends suggested the removal of his collection to London, where he might exhibit it to the public, and, by charging a price for admission to it, gain, if not profit, at least the means of making additions to it. This accordingly was done, and a house prepared for its reception in Leicester Square, the site being that which, I believe, is now known as Saville House. Then it was thrown open to the public on payment of an admission fee in or about 1775, and for some years the results fully justified his expectations, for it became a fashionable resort. It might entertain you were I to read to you a passage describing it at this time. This is from the lively pen of Miss Susan Burney, sister of the well-known Madame D'Arblay, and addressed to that lady, the date being the 16th July, 1778:—"Saturday morning we spent extremely well at Mr. L——, Sir Ashton Lever's, Museum I mean.

.....I wish I was a good Natural Historian, that I might give you some idea of our entertainment in seeing birds, beasts, shells, fossils, etc.,—but I can scarce remember a dozen names of the thousand I heard that were new to me. The birds of paradise, and the humming-birds, were I think, among the most beautiful. There are several pelicans, flamingos, peacocks (one quite white), a penguin. Among the beasts, a hippopotamus (sea horse) of an immense size, an elephant, a tyger from the Tower—a Greenland bear and its cub—a wolf—two or three leopards—an Otaheite dog (a very coarse ugly looking creature)—a camelion—a young crocodile—a roomful of monkeys—one of which presents the company with an *Italian Song*—another is reading a book—another, the most horrid of all, is put in the attitude of *Venus de Medicis*, and is scarce fit to be look'd at. Lizards, bats, toads, frogs, *scorpions* and other filthy creatures in abundance. There were a great many things from Otaheite, the compleat dress of a Chinese Mandarine, made of blue and brown sattin—of an African Prince. A suit of armour that they say belonged to Oliver Cromwell—the Dress worn in Charles 1st's time—etc.—etc.—etc.—In one of the back rooms we found ourselves within hearing of a delightful Concert, but I dared not stop to listen to it, the ciceroni (*sic*) (Sir Ashton was not in town) told us it was at *Giardini's* house—which overlooks the gardens of Leicester House————." *

Like all things of the kind, the fashion for this changed. Idlers wanted some novelty, and neglected poor Sir Ashton's Museum, which had cost him, it is said, £30,000 to form. His creditors became clamorous, and he anxious to sell it; but the difficulty was to obtain a purchaser. I have heard that it was offered to the Trustees of the British Museum at a great reduction, but the Government of the day would not look at it. Finally, a private lottery (those were the days of lotteries) was arranged for its disposal, and in 1785 the prize was drawn by Mr. James Parkinson, a dentist, who took not the least interest in Natural History

* The early Diary of Frances Burney 1768–1778. With a selection from her correspondence and from the Journals of her sisters, Susan and Charlotte Burney. Edited by Annie Raine Ellis. vol. ii. p. 249. London: 1889.

or in Museums. This gentleman speedily found that he had got a "white elephant." However, he set to work to make the best of it, and the first thing he did was to put up a building for its reception on the Surrey side of Blackfriars Bridge. It is said that the building was very suitable for its purpose, but its distance from that part of London where people lived who were likely to visit it made the change a commercial failure. Again, I believe, it was offered to the Government, but in the height of the great war that was then raging, there was no money to "waste" upon such things. Things grew worse and worse with Mr. Parkinson, and at last, in 1806, the Museum was sold by auction piecemeal. Here I have a copy, not quite complete I regret to say, of the Sale Catalogue, on the margin of which the price and name of the buyer of most of the lots has been written—by whom I cannot, however, say. This copy shews that the sale went on at intervals from the 5th May to the 19th July, lasting for 62 days, and the number of lots was 7,524, but there were some other days of which I do not possess the Catalogue. Among the names of the buyers are several which are well-known as those of the chief naturalists of the time—Pennant, Latham, Haworth, Macleay, Donovan—who afterwards had a Museum of his own, to which he wrongfully applied the title of "Leverian"—and "Thompson," under which name a good many purchases were effected for the then Lord Stanley, who afterwards became thirteenth Earl of Derby and President of the Zoological Society, and formed that magnificent collection which, at his death in 1851, he bequeathed to the town of Liverpool. There also occurs very frequently the name of Fichtel, a naturalist who acted as commissioner for the Emperor Francis I. of Austria, and secured a large number of specimens for the Imperial Museum of Vienna, where, as Herr August Von Pelzeln has since informed us (*Ibis*, 1873, p. 14), most of them still remain. But there was no representative of the British Museum, and this is the more to be regretted since the Leverian Museum contained the greater part of the specimens, whether Zoological or Ethnological, that were collected on the three memorable voyages of Captain Cook, specimens which were of inestimable value, and

are (for fortunately some of them still exist) very properly so regarded by their present custodians, the curators of the Museums of Liverpool and Vienna, to which we can almost alone look for the scanty remnants of all the labours of Cook and his companions. The prices obtained were by no means high, and indicate that there was little competition. I have not been at the trouble of adding up the amount, but I should, at a guess, say that the lots did not average five shillings each, which would come to something less than £1,900 for a collection that is said to have cost £30,000. You will find the Monkeys that attracted Miss Susan Burney's attention (in the passages from her letter which I read to you) were sold on the 25th day (p. 124)—"Monkies grotesquely set up." Lot 2903, "The Family Gardener," knocked down to Staples for 13s. "The Bell-man" to Smith for 10s. 6d. "The Coalcarrier" to Thompson (not Lord Derby's man, I presume) for 7s. 6d., while "The Family taylor" seems to have found no purchaser at all, and "The Ballad singers" went for 13s. 6d. to Sivers. *Habent sua fata specimina*—especially at a sale by auction! But perhaps I may read to you half a page or so, taken almost at random.

EIGHTH DAY.

TUESDAY, THE 13TH OF MAY, 1806.

£	s.	d.			
2	0	0	841	War club, new Caledonia; ditto Friendly Islands.	*Rowe.*
	4	6	842	Cordage of the touta, or cloth tree, Sandwich Islands; fish-hook and mirror [*of stone*] from ditto	*Preston.*
	4	6	843	Curious necklace of [*truss'd fowl*] cowry shells, do.	
	7	0	844	Breast gorget, shark's tooth instrument, bracelet, and feather necklace, Sandwich Islands ..	*Fichtel.*
	13	0	845	Curious minute shell necklace, boar's-tusk bracelet, and shark's-tooth instrument	*Mrs. Higgins.*
	2	6	846	Fur boots, Cook's River; and gloves, from [*Asia*]	
	6	0	847	Rattle, shaped like a bird; and model of a canoe, Nootka	
4	4	0	848	Richly carved war-club, Friendly Islands ..	*Rowe.*
1	12	0	849	A very curious feathered idol, ornamented with hair, Sandwich Islands	*Higgins.*
	16	0	850	A feathered helmet and a fly flap, ditto ..	*do.*
	7	6	851	Spear, ornamented with seals teeth, Nootka; and very large spear, Sandwich Islands	*Fichtel.*
3	14	0	852	Ancient English breast plate and helmet ..	*Rowe.*
1	16	0	853	Ancient English hauberk [*Wire jacket*] ..	
	4	0	854	Hammock, made of grass, Spanish main .	*Higgins.*

£	s.	d.			
	19	0	855	Elegant fan, formed of the feathers of rare and beautiful birds, Brazil	*Jackson.*
1	8	0	856	Large ornamented leathern coat, Canada; said to have been presented to General Wolfe ..	*Jennings.*
	10	0	857	Leathern shirt, Hudson's Bay; and part of a rifle-man's dress, N. America	*Higgins.*
	10	0	858	The Ten Commandments, written in the compass of a shilling, elegantly framed and glazed ..	
	4	6	859	A specimen of gold chain, the links of which are singularly fine and delicate	*Ratley.*
	5	0	860	A representation of the head of St. Paul, beautifully executed in cut paper, framed and glazed	
4	10	0	861	Curious German sword, having a complete calendar in that language on its blade [*b.i.* (bought in)]	*Jackson.*
	15	0	862	Very fine specimen of penmanship, by Mr. Tomkins, framed and glazed .. .. [*b.i.*]	*do.*
	11	0	863	A "Vive la Plume," by the celebrated Mr. Brown, of Norwich	*Triphook.*
2	2	0	864	Scoter duck, m. and fem., and hybrid pheasant—two cases	
1	3	0	865	Orange crowned green finch, S. America; white throat; *tringa pugnax*, mas.; reed sparrow, m. and fem., and sky lark, male—five cases ..	*P. Walker.*
	4	0	866	Brown crested heron, N. America [*no legs*] ..	*Sivers.*
	7	6	867	Wire-tailed martin, N. America; petrel, America —two cases	*Newman.*
	10	0	868	Wild-goose, Canada, *anas Canadensis*, one specimen, without case	*Sivers.*
1	2	0	869	Mottled Turkey, m. and fem.	
1	4	0	870	White-fronted goose, *anas albifrons;* large gray gull—two cases	*Soames.*
2	12	6	871	Lesser speckled loon, scaup duck, guillemot, and turbit pigeon—four cases	*Blackman.*
	17	0	872	Buzzard hawk, *falco fasciatus*, N. America ..	*Soames.*
1	8	0	873	Pheasant, S. America [*brown*]	*Lord Stanley.*
5	6	0	874	Brown Heron *ardea caspica*, Africa	*Donovan.*

But I would not leave with you the impression that the "Leverian Museum" was simply an aggregation of curiosities. In many respects it served science well. I can only speak from knowledge of my own special department; but I believe that were I acquainted with others, and especially with Conchology, the same thing might be said. A great many species of birds were first described by Latham in his "Synopsis" from specimens in the Leverian Museum, and PARKINSON (its second owner) began at his own expense a quarto work with coloured plates, the author of which was Dr. GEORGE SHAW, under the title of "Musei Leveriani Explicatio." Five numbers of this were published between 1790 and 1793, while the sixth, commencing a second volume, was issued in 1796; but with this the work came to an

end, though it would doubtless have been continued had it met with greater encouragement. The figures, however, are undoubtedly poor, and the text for the most part meagre, so that one cannot much wonder at its not receiving more support from the public. This was not, moreover, the only useful result of the Leverian Museum. The short peace which followed the Treaty of Amiens in 1801, re-opened communications between this country and France, which had been closed since the outbreak of the Revolutionary War, and the French naturalists (or at least their ornithologists) were not slow to take advantage of it. A not inconsiderable number of illustrated ornithological books had already appeared in Paris, and Audebert and Vieillot, the authors of one of them, commonly known as the "Oiseaux Dorés," obtained from Parkinson drawings by Sydenham Edwards of some of his most beautiful birds, which were forthwith figured in the French work—their origin being duly acknowledged; and, though they cannot be called graceful, very accurate some of these drawings were. About a couple of years ago having occasion to examine the type-specimen of a species of bird described by Latham* which I knew by my Catalogue had been bought by Lord Derby, I applied to my friend, Mr. T. J. Moore, one of our General Secretaries, for the loan of it. With his usual kindness he complied, and when the specimen, by the gracious permission of the authorities, reached me I was much pleased at being able from its attitude to identify it (beyond the least doubt) with the very specimen whose portrait, nearly ninety years before, Sydenham Edwards had painted in the Leverian Museum, and sent to Paris, where it was reproduced by Audebert and Vieillot![†] Such an instance, I think, must be unparalleled, and the marvel is the greater in that, as Mr. Moore afterwards demonstrated to me, the specimen had never been skinned and stuffed, according to modern practice, but had been, so to speak, embalmed, with all its flesh and bones and yet not a feather was missing—a fact that redounds to the credit of everyone concerned in its preservation,

* The Hook-billed Green Creeper of Latham (Synops. i. p. 703) the *Certhia obscura* of Gmelin, and *Hemignathus obscurus* of modern ornithology.

† L'Akaiearoa, Ois. Dor. ii., pl. liii., pp. 111, 112.

and all the more emphasized by the fact that every ornithological specimen of similar age (and there must have been many of them) in the British Museum has perished.

Many other collections in Museums could I mention, had I not already trespassed too long on your time. There was one formed by Mr. Conyers, an Apothecary in Shoe Lane, of which a glowing account may be read in the "Atheniam Mercury" of the 21st November, 1691 (vol. iv., No. 16, quest. 4). I have to thank Mr. Jenkinson, our Librarian, for acting on a clew I gave him and finding this for me; but like the later collections formed by Mr. Leman of the Poultry Compter (which is said to have been the first "Museum of birds preserved in their present manner") and Mr. Rackstrow, which contained beside "a great variety of anatomical preparations*"—these are but names to me. The Museum of Donovan, already mentioned, was of greater importance, and I wish it were in my power to shew you the Sale Catalogue of it (for it eventually came to the hammer) which I once possessed; but some person has relieved me of it, and whether he thereby did a friendly action I do not know.

The last Museum with a notice of which I shall trouble you is one of considerable interest. Everyone in London knows the Egyptian Hall in Piccadilly, but probably very few know that it was built for a Museum, and was so used for the best part of ten years, by the once celebrated William Bullock, of whom the earliest record I can find is on the title page of a book in the possession of a friend of mine—"A Companion to the Liverpool Museum, containing a brief Description of upwards of Four Thousand of its Natural and Foreign Curiosities, Antiquities, and Productions of the Fine Arts. Open for Public Inspection in Five apartments, built and fitted up for the purpose at the house of William Bullock, Jeweller and Silversmith to H.R.H. the Duke of Gloucester, Church Street, Liverpool. The Seventh Edition..... 1809." But that was the last occasion of its being exhibited in Liverpool, for there is what is also called a copy of this same seventh edition, with a new title page, stating among other changes that it is "now open for Public Inspection, in the Great

* Rees's Cyclopædia, vol. xxiv. art. "*Museum.*"

Room, No. 22, Piccadilly, London, which has been fitted up for the purpose in a manner entirely new," while the 4000 Curiosities and so on have grown to 7,000, collected at an expense of upwards of £20,000! The eighth edition of this "Companion" I have not seen, but here is a copy of the ninth, bearing date the following year, in which the words "Liverpool Museum" are dropped from the title page and in their place it is styled "Mr. Bullock's Museum," there being subsequently added "Collected chiefly at Liverpool, during several years of arduous Research, and at an expense of upwards of £22,000." Copies of the tenth and the eleventh editions are also wanting in my series, but here is one of the twelfth published in 1812, in which it is called "Mr. Bullock's London Museum and Pantherium....collected during 17 years of arduous Research and at an expense of £30,000; and now open for Public Inspection in the Egyptian Temple just erected for its reception in Piccadilly, London." This is a copy on large paper, with coloured illustrations, for which (as I find from another source) twenty-five shillings was charged, while the ordinary copies were sold for two shillings. One of these illustrations represents the "Pantherium"—a large room, the middle of which was occupied by an enclosure, in which were placed stuffed skins of an Elephant, Rhinoceros, Zebra, Ostriches and other birds, with models (or something of the kind) of palm trees and such like. The thirteenth edition bears date the same year 1812,—the fourteenth and fifteenth appeared in 1813, the sixteenth in 1814 and the seventeenth in 1816. This is the latest that I have seen. The Museum is simply the "London Museum," and it is said to comprehend 15,000 objects, but the cost of collecting them is omitted. A gradual improvement in the compilation of their Catalogues is observable, and no one can deny that their general spirit is good. There is very little pandering to the popular taste, and an evident desire to give not only the right sort of information but to give it correctly. If time would allow I should like to dwell upon them. That, however, is impossible.

Mr. Bullock was a good man of business. He fixed his show in one of the most crowded thoroughfares of London, and most

justly enjoyed the success due to his forethought. I have heard from Naturalists long since dead and gone that his gains were great, but no one grudged them for he seems fully to have deserved them, and there can be no doubt that he largely increased the taste of the public not only for Natural-History, but for Antiquarian objects. I believe that there was no falling off in the attendance in his exhibition, when in 1819 he resolved to sell off the whole of its contents, and sold they were accordingly in the Egyptian Temple (or Hall as it came to be called). The sale lasted twenty-six days beginning on the 29th of April and ending on the 11th of June. Here is a copy of the Sale Catalogue which gives a better idea of the contents of this Museum than anything else. This copy is a precious one, for while I know from his autograph on the back of the title-page that it belonged to George Cayley, the zoologist who was sent out to Australia by the Linnean Society, I believe that the prices and buyers' names are in the handwriting of a still more eminent zoologist, Dr. John Latham. There is scarcely a page in this copy that does not contain an entry of interest, and were I to begin to dwell upon the several "items" I should never end. I may say, however, that as might be expected from Bullock's character for enterprize, the sale was a great success. Such prices had certainly never been obtained before, and perhaps have never been obtained since. The competition was keen. Four of the chief Museums on the continent sent commissioners, and three of them were distinguished Naturalists. Temminck represented Holland (I wish I had time to tell you of the Museum formed by Temminck's father); Lichtenstein, Berlin; Baron Laugier, Paris; while Fector acted for Vienna; Adams for Edinburgh; and, wonderful to say, the British Museum had its commissioner in Dr. Leach. Among other buyers occur well known names—Lord Stanley was of course well to the fore, and beside him were Sabine, Swainson, Vigors, Capt. Browne (whom I at least remember), Dr. Goodall, Sir Thos. Ackland, Lord Temple—dealers such as Leadbeater, Warwick and Molinari; and lastly Sir Walter Scott. The only "items" to which I will call your attention are some which are perhaps the least worthy of it, for they have no scientific interest at all. On

the twenty-sixth and last day of the sale were put up the Napoleon relics. First there was the carriage taken by the Prussians at Waterloo, and given by Blücher, with all it contained, to the Prince Regent who sold it to Bullock for 3,000 guineas. The carriage fetched £168, being bought by Mr. Hopkinson, a coach-builder in Holborn. You may have seen it now in Madam Tussaud's! Lot 13, which fetched £3 : 4s., was a "Complete uniform of the Colonel of Lancers, worn by the son of Louis Buonaparte, when nine years old." This is the young gentleman afterwards known to the world as the Emperor Napoleon III. One of Napoleon's tooth-brushes brought £3 13s. 6d.; a second, £3 only. Lot 70 fetched £7 8s., and consisted of "A Drawer from a small Canteen, containing a Tumbler glass, two small Tumblers for Spirits, an Egg-cup of China; Pepper, Salt-box, and Mustard-pot, all of silver, having the contents as left by the Emperor at his last breakfast before the battle of Waterloo still in them" Lot 78 was "A Glass Spirit-bottle, with the Rum left by the Emperor still in it," and brought £2 8s. Lot 103 was "A silver Helmet, taken at Waterloo" and was knocked down to "Walter Scott, Esq.," for £5 15s.; while Lots 105 and 106 consisted of a set of chessmen and a set of card markers, both "used by the Emperor in the Russian campaign" and brought respectively £2 9s. and £1 16s.

I must apologize to you for having kept you so long. If I have failed to interest you the fault is my own, for I am sure the subject of which I have been treating is one that properly handled could not fail to be of interest to an Association like this. I should hope that at any rate some one of our Members may take it up; and, if he does not attempt to write a history of the rise and progress of Museums, at least put together materials that might serve to form such a history. I am sure it would be worth while, and if these stray hints that I have offered you to-day may lead to that result, I shall be more than rewarded, while he himself will not fail to find satisfaction in recording the varying, but I think generally successful, fate of those who like ourselves, Mr. President and Gentlemen of the Museums Association, are engaged in a vocation so interesting, so laborious, so useful, and therefore so honourable.

DISCUSSION ON PROFESSOR NEWTON'S PAPER.

THE PRESIDENT pointed out the fact that museums had not yet had a historian, although an exhaustive history of Museums would be a work replete with interest. He suggested that Professor Newton was himself the man best fitted for the task. The question of the origin of Museums had yet to be worked out. It would probably be found that the first collections were made by monks, and he would advise a careful search amongst monastic records. It was certainly a not unfrequent practice for curiosities to be deposited in monasteries and churches. As an instance, he would quote a case which had come under his notice in which some Emu's eggs had been placed in a church on a beam behind the altar, probably from an impression that they were Dragon's eggs. Many objects of interest were preserved for quasi-religious reasons: thus, the horn of the Narwhal was preserved as the horn of the Unicorn of Scripture.

MR. HIGGINS referred to the advantages consequent on having a meeting in Cambridge. In no other place, and from no other man than Professor Newton, could the Association have had such a paper. He expressed a hope that Professor Newton would continue his researches into Museum history.

MR. PATON expressed his inability to discuss the paper, but added that one point of much local interest had been suggested by it. Had Mr. Bullock catalogued a ring which is known to have been removed from the so-called tomb of St. Mungo? The people of Glasgow would be much pleased if the subsequent history of the ring could be traced.

MR. RUDLER suggested that in consideration of the very large amount of research that would be necessary in writing a History of Museums, several investigators might undertake the work, each selecting a different field.

MR. OGLE stated that the Bootle Library, which was under his charge, contained a copy of Bullock's Catalogue, but that until he had heard Professor Newton's paper, he was ignorant of the historical value of the work.

PROFESSOR NEWTON, in replying, said that he could not immediately answer Mr. Paton's enquiry as to the fate of "St. Mungo's" ring, but he pointed out the fact that Mr. Burns, of Glasgow, had presented several objects of interest to Mr. Bullock, and suggested that the ring might have been one of the specimens thus presented. He would point out further that Mr. Bullock, though an intelligent and even enthusiastic collector, never forgot that he was a jeweller and silversmith, and was always ready to sell if a really good opportunity presented itself, so that the fact of the ring not being included in the Catalogue was no proof of his not having been its possessor at some time or other.

LIFE-HISTORY GROUPS.

SUGGESTIONS ON THE DESIRABILITY OF EXHIBITING IN MUSEUMS DRAWERS OF UNMOUNTED SKINS OF BIRDS.

Ornithologists have long been agreed that for scientific purposes, and for students only, there is no better method of preserving a collection of birds than by arranging the properly prepared skins in drawers or trays where they can be handled, and similar organs in allied species closely compared.

It has, however, always been obvious that this method could not meet the requirements of ordinary visitors to Museums; and since, probably, drawers of unmounted specimens of birds have rarely been shewn to the public, less than deserved attention may have been given to their treatment as exhibits.

A great advance has somewhat recently been made in the method of preserving examples of the animal kingdom for Museum purposes. Your thoughts will at once recur to the prominence given in many collections to what have been termed picturesque groups, in which the various stages in the history of a bird, or a mammal, have been illustrated by examples brought together for observation and comparison.

In Birds, the differences in plumage between the sexes, or the absence of such a distinction, a fact scarcely less instructive than the former, the change in feather from the down of the newly hatched chick, through the years of its subsequent life, or through exposure to seasons of cold and snow; the nest, whether it be an exquisite structure of bird architecture such as no human hands could put together, or a mere white-flecked cavity in a rock without even a weed to soften its unhomelike severity; eggs that have a world of meaning of their own if they could be decyphered; lastly, something of environments suggestive of habits and mode

of life in the species illustrated; these must in future be regarded as the choicest and most excellent feature in the exhibited portions of ornithological collections.

It is to afford more room for these that the question is now raised whether drawers or trays of unmounted birds' skins can be regarded as suitable objects for exhibition. This will be fully considered further on. Meanwhile the method of arrangement already spoken of may, on account of its undisputed superiority, receive our more immediate attention.

Soon after the removal of the National Collections of Natural History to Cromwell Road appeared in the galleries surrounding the Central Hall a series of cases each containing one species of Bird indigenous to Britain. They were mostly of common kinds, the frequenters of our hedges, roadsides and woods, and even of our cities. There was nothing whatever likely to be especially attractive in the kinds selected, any more than there would be in a cabinet of butterflies consisting of our Garden Whites.

But the transforming step had been taken; the observant eye and skilful hand of a true lover of nature had been in operation. If the bird were only a sparrow, nothing that a sparrow would care to call its own was thought too insignificant to appear with it; and the like was true in respect of all the other species. The result was marvellous, and I need hardly say encouraging. Visitors came away to spread in distant quarters their enthusiastic admiration. Have you seen the new bird cases at the British Museum? was the first greeting between many naturalists in the provinces. Wag-tails and Tit-mice seemed to tell their little stories of loves and homes and families, in a way that won over human sympathies, and, for a while, the encomiums passed on the grandest rarities in the Metropolitan Museum, were shared by objects supposed to be under the ban of excessive familiarity.

But it was not the quality of picturesque beauty that gained for the groups such distinguished estimation, but something closer to nature still. It was as if a ray of animal Psychology had shone in the great temple of animal Morphology and Comparative Anatomy. Birds, common, and of no size to speak of, were seen to be not mere things of body and bones and feathers; they had stories to

tell; one day with them had not been like every other day, passed in a round of dull monotony; like ourselves they had known something of the sadness, and much of the happiness, of living; for was not life their common heritage and the society of their fellows a delight renewed with the sweet return of every approaching dawn.

It is the realizations of life that is the surpassing quality in these groups, and their value is very imperfectly represented when they are named after their property of picturesque beauty. The writer trusts to have the united consent and support of the Museums Association in suggesting as the most natural and simple name for this increasingly important appliance, equally suitable for birds and mammals—the "Life History Group."

The writer would not be thought to be indifferent to the principle that in any illustration of Nature, in a school of observation, for such is a Museum, prominence should be given to the characteristic of natural beauty, which is as much a genuine feature in Nature as the "survival of the fittest." It is indeed noticeable in certain savants that they lay great stress upon the character of illusory notions held by plain people on beauty as admired in natural productions. But experience teaches that these savants have no courage of their opinions. Only let one of them fall in with destiny in the shape of feminine grace in some personally attractive human specimen, and beauty straightway becomes to him the most real thing he has ever known in his life; and he ignominously yields without making even a decent struggle for the tenet he would impose on plain people.

But, although beauty is a genuine and worthy source of admiration, it is not, I think, the source of the highest kind of influence to be derived from such an assemblage as a life-history group. This may well be, the calling forth of sympathy with life in nature which is one with our own life, but with obviously inferior capacities. For in our admiration of graceful forms and exquisitely combined colours, there may be much of selfishness. We are receivers of sensuous impressions which are automatically gratifying, whilst we ourselves spontaneously contribute little.

Whereas in the sympathy called forth by the life-history group

our response rests not with the Museum illustrations, be they ever so perfect. Our inner-self cares less for the mere prettiness that is agreeable, and more for the page of life that is laid open before us.

It may be urged that such thoughts are refinements, of no practical value. But is not such an objection in anticipation of issues which, as curators, it is our calling and our honour to develop by experiment? We are, or might be, deeply dissatisfied with the results of Museum work in the community. Our presence here to-day is witness that progress is to us no matter of indifference; and of all the indications of recent Museum progress, the life-history group is the most entirely satisfactory.

Perhaps it is time for me to confess that the whole scheme for the exhibition of unmounted bird skins has its origin, so far as the writer is concerned, in the immeasurable superiority of the life-history group. It is worthy of almost any sacrifice. A small Museum in which the spirit of the "Life-History" group has the highest consideration, counting for more than a multiplicity of species, is better than a large Museum in which serried ranks of vertebrates stand side by side as if on duty in a perpetual, motionless parade.

Let it not be deemed that my task is to demolish a man of straw. The prejudices, in favour of many of the inferior old lines, hold their own tenaciously; especially those in favour of linear arrangements and multiplication of species.

Many votes would be given in favour of having a large Museum, with the corollary that as much as possible of the exhibition space should be closely occupied by specimens of the greatest possible variety of species.

Now, as my suggestion is in direct opposition to this, demanding what would be termed a great sacrifice of space, and it may be, the shutting up of some examples already exhibited, whilst far more than ordinary room is claimed for a single species, I cannot afford to lose a vantage point, and, thus far, have mooted only the main question—Is the Life-history group worth all this?

We have already referred to the high estimation in which series of unmounted bird skins are held by ornithologists. But it is obvious that the plan has not been regarded as applicable, except in collections of considerable extent and importance. Our chief

Metropolitan and University collections adopt both methods, and some magnificent private collections consist entirely of unmounted skins.

In ordinary Museums, almost all the birds are mounted, and the entire stock may be divided into two sections—mounted birds forming parts of "life-history groups;" and birds as they are commonly mounted, and too appropriately known as "stuffed birds."

It is rare to find the space devoted to life groups, bearing any comparison with the space occupied by birds prepared after the older fashion.

Assuming it, therefore, as probable that the whole space in a Museum, available for birds, is fairly occupied—Why are the life history groups so sparingly present?

For several reasons. First because the materials are less easily to be obtained, and require the aid of a Taxidermist of a higher class.

Secondly, and, as I fear, chiefly because the introduction of a fresh "life-history" group only adds a single species to the collection, whilst it may shut out a dozen or a score of named species—those privileged possessors of wall cases in which birds are distinguished chiefly by being set a little higher, or a little lower, as if they were perched upon a set of chess-men.

Is this our way of shewing respect for nature? Are we hoping to found *higher teaching* on the old lines of bringing out a list of our Museum species with the smallest number possible of vacancies?

Still, a sacrifice of exhibition space is a serious matter, and when attended by the loss of several species in making room for the fuller illustration of one, the question assumes even a graver character.

In relief of such difficulty, it is suggested that a considerable number of birds, ordinarily stuffed, might be withdrawn from the wall cases without being altogether lost to the sight of Museum visitors.

Mr. T. J. Moore, Curator of the Liverpool Museum, and Local Honorary Secretary at the last Meeting of the Museums Associa-

tion, whose absence from the present Meeting we all sincerely regret, has kindly selected for me two drawers of unmounted bird skins, which may suitably illustrate the proposed method; and my few concluding remarks may refer to certain special advantages attending this method of arrangement.

Certain phenomena in bird life may more readily be exhibited, and their special significance pointed out. For example, let the group consist of specimens in all of which the plumage of the males and females is almost exactly alike. Birds from several families, or even Orders, are in this way likely to be brought together, having this feature in common. Is there nothing of life-history to be learned from such a peculiarity, shared by birds systematically wide asunder?

Many groups of unmounted skins may be made peculiarly interesting by the circumstances of their geographical distribution. Mr. Moore has favoured me with a notable example. One of the drawers before you contains birds of Palestine only. The plan is especially valuable for the display of associated qualities outside the systematic pale, giving them a prominence which they could not have if embodied in the main collection, which has hitherto been too exclusively regarded.

Suffer me to take a single illustration from invertebrate animals. I have noticed in several Museums a fine series of shells from Lake Tanganyika, including molluscs from a considerable number of genera. These might have been placed apart in the systematic position assigned to each in the main series of the collection. But thus separated, would they have told their story, and the prehistoric story of their continent and of its great lakes, by their conspicuously half-maritime characters, as they do when seen together in a group?

To return to the question of unmounted bird skins. It is not contended that this is the best possible way of preserving birds, except for students, but that it may be so used as to obviate any necessity for crowding the wall cases with specimens of small or middling size, the systematic order of which reveals very little to observation, whilst the space might be much more instructively occupied. Take, for example, a group or a series of groups,

illustrating "mimicry." Ordinary protective colouring in birds is too common to serve for a basis of segregation; but mimicry is rare amongst birds.

Mr. A. R. Wallace, however, gives a fair number of examples, including our British Cuckoo and Sparrowhawk.

It would be quite possible to place a cuckoo amongst birds of prey, or a sparrow-hawk along with the doves to be near the cuckoo. And, perhaps it would be better even so, than that the existence of mimicry amongst birds should be unrecognized.

It will be urged that if we are to have all these extra-taxonomic phenomena made prominent, we must have much more room.

Precisely so. Many a touchingly interesting life-history group is enfeebled by being cramped for want of space. Probably nearly all the best life-history groups in ordinary collections would be more impressive if each group had fully twice the space assigned to it. And it should be remembered that these life-history groups are the very highest things that a Museum has wherewith to invite observation in its bird rooms. Next to them are the other kinds of groups. Of course, large birds and birds of special interest, such as *Balæniceps rex*, are out of court; they can take care of themselves. But in Museums, not very extensive, I have seen yard after yard of wall cases crowded with bird specimens that might nearly as well have been artificial flowers.

Here then is the occasion for a vigorous use of unmounted bird skins.

Clear the crowded wall cases of all but the best and most instructive examples, and supply the place of the banished ones by groups which, at all events, shew something of bird-life and history.

Neither need the Curator be disconsolate if the gaps in his linear arrangement seem more formidable than ever. Gaps and missing-links are the rule, not the exception, in the exhibited portion of Nature's grand collection.

The loss will not be great. Compare some yards of wall cases, such as have been described, with series containing the same species gathered tastefully, lovingly, and with due care for order, in drawers or trays as unmounted bird skins, and the simple,

unpretending aspect of the forms that once soared, or sang, or wooed their mates, will win.

What will be won? I dare not say—the solution of the great Museum problem—the valid suggestion of living nature outside the Museum walls—but, I think, one small step in the direction of its solution. The drawer may rank before the crowded wall-case in enlisting sympathy. Not a mere pity for the birds because their life is extinct. In the highest sense such is not the case. Their life is living on still in their descendants.

The sympathy I speak of is not for the specimens, but with the species.

If we are sensitive to the light which in our day has been thrown on the due conception of a species, it is pessimistic to doubt that human sympathy with Nature will be of a higher kind than it has ever been before.

The Gifford Lecturer for 1888-89 pleads for the elevation of Modern Divinity, not by the substitution, but by the infusion of Natural Theology. Not less is the infusion of a reverential spirit needed for the elevation of modern Biology—which is so satisfying to the intellect and so regardless of the affections.

It is better for a Museum to be loved than to be admired.

How many thousands possess genuine love for a common field of grass, set for mowing, with its ox-eye daisies and spikes of spotted orchis, who, nevertheless, regard a Museum as little better than a bore?

We are not content to have it so; but is it a mere utopian fancy that a Museum should ever be loved—should ever animate its visitors with a refreshing sense of heart's delight, such as rises unbidden in the presence of Nature's simplest scenes, innumerable?

Not so indeed. The germ of such a realization is before us; its day has dawned. The Museums Association is not its origin; but may it not be one of its co-operative results?

In no aspect is our united fellowship and work seen to be more encouraging than when recognized as evolved by the progressive spirit of the age.

HENRY H. HIGGINS.

DISCUSSION ON MR. HIGGINS' PAPER.

THE PRESIDENT agreed with Mr. Higgins in thinking it desirable to relieve the wall cases, but did not think that curators would attract the public by putting bird-skins into drawers. The skins might, however, in that form be very useful to students. The plan of setting up life-groups was, he thought, not without danger. Even the best attempts of the most skilled artists had been criticized, and the groups set up by inferior hands would be worse than useless. He could not remember without a shudder the old-fashioned "natural" group with its back-ground of paste-board rock.

MR. CAMERON strongly defended the use of stuffed birds. He urged that stuffed specimens shewed the shape of the bird (a very important point) and to a certain extent could be made to illustrate its habits, while skins could not convey either. He quite approved of life-history groups, but objected that if displayed in number in most provincial museums they would leave no space for the full representation of all orders of birds. He maintained that it was hopeless to attempt to reproduce Nature, except in a very small scale, and that the aim of the Museum curator should therefore be to epitomize, rather than to copy, the outside world.

MR. HOWARTH urged that in Mr. Cameron's scheme the student was too little thought of, in comparison with the public. He pointed out that it was far easier to identify specimens from skins than from stuffed birds, and he advised having as complete a collection of skins as possible in drawers, for the use of students, and exhibiting a limited number of representative birds, putting them, where practicable, in life-history groups.

PROFESSOR NEWTON pointed out that the difficulty in having birds set up was the fact that extremely few men had the art of reproducing the attitude of a bird accurately, and that even they must frequently have come across birds of whose habits they were ignorant. He objected to life-history groups for two reasons.

In the first place nearly each one signified a violation of an Act of Parliament. In the next place they were actually detrimental to the study of Natural History. Artists and students copied the groups in the British Museum, ignorant of the fact that they were often copying inaccurate representations of Nature. And even where such groups were faithful, they did harm by leading students to substitute indoor work for that actual contact with Nature which is an indispensable element in the education of every true artist.

THE REGISTRATION AND CATALOGUING OF MUSEUM SPECIMENS.

The subject with which I propose to deal in the following paragraphs is of so practical a nature that I scarcely feel that any apology is needed for bringing it before our Association, even though it involves a paper made up of technical details. My object is in the first place to lay before you certain methods which have been adopted in the Manchester Museum, and in the second place to ask the advice and criticism of those present upon a scheme which has not, so far as I am aware, been carried out in any Museum, but which seems as though it might possibly contain the germ of a valuable system.

I.—REGISTRATION.

By this term I mean the recording in a book of every specimen as soon as it enters the Museum, no matter what its source or nature, and the affixing to it of a reference mark so that at any future time its history may be traced. The register corresponds in fact to the "Accessions Book," which is a well-known instrument in library work.

I need not here enter into a discussion of the comparative merits of different systems of carrying out this work, but will at once describe the system adopted in Manchester, which has several points in common with that in vogue in the British Museum (Natural History), as well as with that used by Dr. Kraepelin in the newly-erected Natural History Museum at Hamburg.

The main object of the details is to minimise labour—a point

of the utmost importance—for I think you will bear me out when I say that every Museum with which I am acquainted is undermanned.

Our register is kept in quarto volumes, 14 in number, corresponding to the following divisions of the contents of the Museum, and with reference letters as follows :—

A. Mammalia.
B. Aves.
C. Reptilia.
D. Amphibia, Pisces.
E. Mollusca.
F. Insecta.
G. Crustacea, Arachnida, Myriapoda.
H. Vermes, Echinodermata.
I. Cœlenterata. Porifera. Protozoa.
K. Botany.
L. Palæontology.
M. Petrology.
N. Mineralogy.
O. Anthropology.

Each page has columns thus :—

NUMBER.	DATE.	NAME.	LOCALITY.	REMARKS.
1.	.....	.....	.....	.....
2.	.....	.....	.....	.....
3.	.....	.....	.....	.....
4.	.....	.....	.....	.....

There are 25 lines in each page, and each book contains numbers from 1 to 12,500.

When any specimen arrives at the Museum the first vacant number is affixed to it, and the appropriate information filled in. The numbering of the specimens has received consideration, and different methods have been adopted for the different groups, in accordance with the conditions under which they are usually preserved.

For example, in the case of the Mammalia, gummed labels have been prepared, ready numbered, which can be affixed either to the stands of the specimens or to little cardboard tags tied to them. The labels measure about $1\frac{1}{2} \times \frac{1}{2}$ in., and are made in sheets of twenty-five each, ready perforated for tearing off, and

each set is kept in a separate box, marked with its distinctive letter. When a specimen is registered the corresponding number is torn off and affixed to the specimen.

In the case of specimens which are generally preserved in spirit, such as fish and worms, it seemed better to have the labels made of parchment paper, and similar sets printed on this material have been prepared.

In the Shells and Insects small type numbers are the most useful, and I have found that the cheapest mode of procuring these is to print them on gummed paper with the typewriter. In the case of Insects the pin carrying the specimen is run through the numbered label before being pushed into the cork, so that the label is not obtrusive but can always be seen when required. In the case of Rock specimens and Minerals the number is painted on them with sealing-wax varnish or other red pigment.

I may add that where the specimen is of such a nature that a number can be written upon it with ink and a fine pen, this is done as an additional safeguard. A separate number is allotted to every specimen, the only exceptions recognised being minute forms such as Foraminifera and Copepods, which are so often kept in numbers in glass tubes; in such instances one number is given to the whole tube, and a general indication of the quantity, such as "several," or "many," is given in the register.

I may point out what seem to me to be one or two advantages in this method.

1. It reduces work to a minimum, and also the information necessary to affix to the specimen is small.

2. Specimens can be registered without being named; for this purpose it is only necessary to know the sub-kingdom to which a specimen belongs, and in a small Museum which worked with one volume only, not even this knowledge of it would be required.

3 In case of pressure, specimens can be put aside for future registration without danger. Suppose a collection of fossils

came to hand when it was impossible for the curator to number them, all that would be needed would be to count the specimens, leave so many blanks in the register, with a pencil memorandum that those numbers were reserved for that special collection.

II.—CATALOGUING.

Under this head I propose to speak only of what I may term the "Curator's Catalogue," by which I mean his official record of the contents of his Museum arranged according to a natural classification. It is the source to which he will turn if asked what material his collection possesses, illustrative of any particular group.

All the catalogues of this kind I have ever seen have been in MS.—generally with more or less space for additions, but often with none. When I was appointed to the keepership of the Manchester Museum it occurred to me that the system of card catalogues, which has been found so useful in libraries, could not fail to be serviceable in Museums also. Its most conspicuous advantage, viz., the facility with which it can be kept up to date, being just as marked in the one case as in the other.

After some consideration the following mode of carrying out the idea was adopted. Each species was to have its own card; the species of each genus were to be placed together and backed by a somewhat larger card; in like manner the genera of each family were separated from those of other families by a still larger card. We had thus to provide cards of three sizes, which we may call respectively the "species," "genus," and "family" cards, and for further facility of distinction it was decided to have them of different colours.

The "species" card measures $5 \times 2\frac{3}{4}$ ins., and is white; the "genus" card measures $5 \times 2\frac{15}{16}$ ins., and is greenish grey; the "family" card measures $5 \times 3\frac{1}{4}$ ins., and is buff.

There is, of course, nothing of general importance in these sizes—they were selected so that they could be used in the "Hammond" typewriter, which I happened to posses.

The cards are ruled thus:—

	CIDARIDÆ.	
	CIDARIS,	
	hystrix,	
Spirit.	H 2075	Faeroe Channel,
Cidaris. Rev. Echin., p. 304.		O

The effect of this is that when the three cards are placed together one sees the family above, the genus below, the species again below that, whilst the remainder of the card is occupied by particulars regarding the various specimens in the collection. Each specimen has a separate line, and the first column gives the nature of the specimen and mode of preservation, the second the register number, and the third the locality. The cards are kept in drawers, made with partitions of the exact breadth to receive them, similar to those used in libraries where card catalogues have been adopted. Each card is perforated with a hole five-sixteenths of an inch diameter near the bottom, and a brass rod fixed to the bottom of the drawer can be passed through all these holes so that there is no risk of the cards losing their relative positions. As a precaution,

however, in case of any card being separated from its fellows the generic name is written at the bottom left hand corner of each "species" card, and the family name in the same position on every "genus" card; a reference to its description in some standard monograph being often added.

Whilst this scheme was being worked out I was occupied in cataloguing and arranging our Museum Library, for which purpose I was led to adopt the decimal classification of Professor Melvill Dewey. I am not prepared to enter into a defence of that system in *all* its details, but a practical acquaintance with it in the Museum Library, and in my own collections of pamphlets and of magic lantern slides has convinced me that in its main features it rests on a sound practical basis.

More than once whilst engaged in this work the question occurred to me, "Would it not be possible to classify and number the whole Museum on some such system as this?" I had not, however, proceeded further than to ask myself the question when I read in "*Nature*" the following letter from Mr. Flinders Petrie, in which the same point was raised. Mr. Petrie's letter, like everything he writes, is so clear and at the same time so concise that I shall make no apology for quoting it *in extenso*.

"CLASSIFIED CATALOGUING.

Whenever a collection has been catalogued anew, and all the numbers are in the museum order of the specimens, the placing of additions at the end, without any sequence but that of acquisition, always seems a melancholy collapse of the order just established. So strongly is this felt that some curators even enter additions with the same numbers as similar specimens, distinguished by letters, as 3247*a*; but, as formerly in the British Museum, this system breaks down when such additions far outnumber the original series, and we reach figures like 3247*fj*. At the same time this is an approach to an entirely different and logical system of cataloguing, which ought to be considered. Another stage of arrangement has been by appropriating so many thousand numbers to each branch, so that the articles of one class may have contiguous numbers.

The complete system of cataloguing which has been thus felt after, and sought for, is what may be called "fractional cataloguing," treating all numbers as decimal fractions and arranging them accordingly. Thus 21·765, 21·77, 21·8, and 22 might appear as successive numbers in a catalogue: the numbers being arranged solely by their successive order of the left-hand figures, regardless of the length of the number. By this system, therefore, any quantity of additions can be brought into their right order without disturbance; fifty new specimens like No. 371, for instance, being numbered 371·01 to 371·50.

The first two or three places of the number will therefore indicate the nature of the specimen in any given catalogue: and this leads at once to the desirability of all collections having a similar numerical basis for their catalogues, so that if all the parrots, for instance, begin with 56 in one collection they should do so in all other museums.

The first step therefore in classified cataloguing would be to agree on a set of 100 or 1000 numbers, to subdivide each branch of science, the distribution of the numbers being partly settled by the average number of specimens, partly by natural divisions. Thus in mineralogy, elements might be 001 to 099; binary compounds 100 to 298; silicates 300 to 799; non-metallic acid salts 800 to 899; metallic acid salts 900 to 999. In all museums, then, silicates, say of lime, magnesia, and alumina, would begin with 61, the different species being marked 610 to 619, and varieties and individual specimens numbered with additional decimals following these bases, *e.g.*, 615·47. The set of numbers in each science would be best fixed by a committee at some International Congress, so as to insure general acceptance, like the scheme of geological colouring.

The disadvantages of this system would be—(1) that the catalogue would have to be kept like that of a library, subject to additions at any point, and therefore on slips which could be transferred; and (2) that the total number of specimens would not be known except by counting. These are not serious difficulties, and the following advantages seem to entirely out-weigh them.

(1) The numbers would indicate to all students the nature of the

specimens quoted in any collection. (2) The catalogue would be classified in natural order throughout, so that all similar specimens would be described together. (3) The numbers in the museums would be in order from end to end. (4) Any specimens moved could be rearranged by unskilled assistance, solely by the numbers. (5) Any object in the catalogue or hand-books could be at once found in the museum by its number. (6) A great help would be given to the arrangement of minor museums by having a uniform scheme of cataloguing fixed. (7) The numbers being in constant use would soon form technical symbols for species, a short-hand briefer than chemical symbols even, and applied to all sciences; and also a valuable key to the memory.

Bromley, Kent. W. M. FLINDERS PETRIE."

A system of this kind might be adopted in two different ways. In the first place each museum might work on its own lines independently. For example, in any museum the specimens might be arranged in systematic order and then numbered from 0001 up to say 5000. Then any fresh additions could be intercalated in their proper places by the use of further places of decimals. Thus, supposing the collection possessed a specimen of *Eupagurus bernhardus* numbered 0567, and that *Eupagurus Prideauxii* were added, it would become 05671; or if it were desired to leave space for the addition of further specimens of the former species, it might be 05675.

Such a mode of procedure would, however, sacrifice all the advantages that spring from co-operation, several of which are indicated in Mr. Petrie's letter. A better system would be the elaboration of some inclusive scheme by the labours of several specialists, which might be used by any museum which felt so disposed; and it seems to me that such a body as the Museums' Association is the proper one to undertake a task of this kind.

Before proceeding further let me notice a few objections.

1. The difficulty of getting such a scheme generally adopted. It may be laid down that no specialist is ever satisfied with any other specialist's work, even if he be with his own, and the difficulty of drawing up a scheme which would be generally

acceptable is perhaps overwhelming. I should be glad to hear the opinions of my colleagues upon it.

2. The difficulty of keeping it abreast of the progress of science. This is of less consequence because museums must in the nature of things move slowly, and cannot immediately adopt every new ray of systematic light.

3. Expense of drawing up such lengthy tables as would be necessary to do the thing completely. It would not, I feel sure, be practicable to draw up a classification covering the whole of the species of the animal kingdom—at all events, not until Mr. Sherborn has completed his index of the genera and species of animals; but, perhaps, a scheme extending to genera, or even only to families, might be useful, and each museum might number on its own lines thereafter.

I may say that I have not come to a clear opinion on the matter myself, but I have brought it before your notice with the hope of getting the opinion of my colleagues, most of whom have probably had more experience of cataloguing than myself.

DISCUSSION ON MR. HOYLE'S PAPER.

MR. CLARK complained that the usual method of using a rod on which to string the cards caused great loss of time when new cards had to be inserted. It was also very difficult to turn a card when there were many on a rod. He would suggest the use of longer and thinner cards.

MR. PLATNAUER said that the two greatest difficulties he had experienced in affixing labels to specimens were (1) that the gum became brittle after a time, and (2) that the corners of the labels curled up. The latter difficulty would be met by cutting off corners or by using round or oval labels. He thought Mr. Hoyle's plan excellent, and calculated to save time and labour, but he pointed out the great difficulty of altering established methods of registration in old Museums.

MR. BATHER advised the use of fish-glue instead of gum, on the ground that it did not become brittle. With regard to Mr. Hoyle's scheme, he expressed a fear that its general adoption would destroy individuality in Museums.

MR. BUTLER WOOD, speaking of the difficulty mentioned by Mr. Clark, said that he had found it a good plan to use thin labels, and to keep them in a drawer a little deeper than the label.

MR. CARR said that Mr. Hoyle's advice to label all specimens was often impossible to carry out on account of the small size of the specimens to be labelled. He expressly instanced the smaller Gasteropoda, such as *Rissoa*.

MR. HOWARTH complained of the frequency with which the paper labels gummed to a specimen fell off. He himself preferred the plan of painting a number on the specimen where possible. He then briefly explained the system of registration in use at Sheffield, the specimens catalogued being divided into sixteen sections, each section having a separate volume devoted to it, and being distinguished from other sections by a letter.

MR. OGLE recommended the use of thick cards, pierced by an elongated hole or slot through which a rod could be passed. This plan would allow of the pulling up of any one card without disturbing the others.

MR. MADELEY considered rods unnecessary, except where a large number of cards had to be fastened together. The danger of using written cards was the temptation to write them hurriedly, and therefore carelessly.

MR. RUDLER said that oval labels were used in the Museum of Practical Geology (Jermyn Street), but that they frequently peeled off. He had, however, found that this could be prevented by varnishing the label, and allowing the varnish to go over the edges so as to form a rim round the label.

MR. HIGGINS considered that the present uncertainty as to generic limits in Zoology would be a serious difficulty in the way of carrying out the schemes suggested by Mr. Hoyle. He would also deprecate anything that tended to destroy the individuality of Museums.

MR. STORRIE, in answer to Mr. Higgins, pointed out that the schemes mentioned by Mr. Hoyle were schemes for *registration*, not for *labelling*. They would enable anyone to rapidly find the reference to any specimen, but that they committed us to no Zoological theories, and allowed of every variation in labelling. He further asked what substance was best adapted for marking numbers on specimens.

MR. BATHER advised Stephen's "Ebony Wood Stain" for this purpose.

MR. HOYLE, in replying, said that he agreed with Mr. Madeley in thinking rods unnecessary for the fastening together of cards. He urged the great importance of using a gum or cement that was strongly adhesive, and not liable to change. In answer to Mr. Carr's remarks, he said that small objects should be put into tubes, and the tubes should be labelled in the same way that larger specimens were. With regard to the schemes of registration that

he had put forward, he did not consider that his experience of their working was sufficient to justify him in strenuously upholding them, and his object in bringing them forward was partly to hear them discussed. But he thought that he might fairly claim for them the advantage of saving time and labour.

ON THE DIFFICULTIES INCIDENTAL TO MUSEUM DEMONSTRATIONS.

BY

F. W. RUDLER, F.G.S.,

Curator of the Museum of Practical Geology.

No one can long have held official connexion with a Museum without having been solicited to give a demonstration upon some of its contents. And, probably, few who have acted as demonstrators, if they have given serious attention to the wants of their audience, can have felt that their performance has been altogether satisfactory.

In order that a demonstration be successful, it is essential that everyone present should *hear* what the demonstrator says, and *see* the objects which he is describing. The speaker should face his party, be in a slightly elevated position, and, while he is referring to a given specimen, all the audience should be able to see the specimen *at the same time*, so as to follow the words of the demonstrator. But, how rarely can these conditions be fulfilled!

In the first place it is necessary to secure a large area in which the party can assemble in the immediate neighbourhood of the specimens to be described. This is by no means always easy. A large modern Museum may perhaps offer the necessary space; but most Museums become, in the course of time, so crowded that the cases are necessarily placed too close together, and the area thus becomes so broken up that only comparatively narrow passages are free. The visitors are, therefore, more or less scattered, and only a favoured few can see and hear.

Suppose, however, that the necessary space is obtainable, and that the party is able to congregate around the demonstrator, how can he proceed with his discourse? If he is describing a large object, like the skeleton of a mammoth, there should be no diffi-

culty; all can, of course, see what is being described. But when the speaker turns to the small objects in glass-cases, he immediately encounters grave difficulties.

In most Museums, a large proportion of the specimens will be exhibited in upright Wall-cases, and when the demonstrator turns to these objects his back is presented to his audience. This is obviously a disadvantage to his hearers; but let that pass.

He points to a certain shelf, and the few spectators immediately at his side see what he is referring to, and appreciate his description; but the others, forming the large outside group, see nothing until the demonstrator and the little circle around him pass to the next case. By the time, however, that the outsiders can obtain a glimpse of the specimens in the first case, the demonstrator has begun to talk about those in the second: hence the bulk of the party labours under the disadvantage of hearing one group of objects described while they are looking at quite another group. No wonder, then, that they get bewildered, lose interest in the demonstration, and leave without carrying away any educational benefit.

Nor are matters much better if the specimens forming the subject of the demonstration are exhibited in a Table-case. The demonstrator naturally stands in front, leaning over the case in order to point to the most interesting objects; he thus, of necessity, monopolises the best position himself, and, with the exception of the favoured few at his elbow, scarcely anyone sees what he is describing. Those at a little distance to his right or left find it difficult to catch any glimpse of the object described, while those behind certainly see nothing.

If the table-case stands against the wall, no one can be in front of the demonstrator; if it is free, it is generally double-sided, and the visitor at the opposite side either sees nothing or sees the object of the demonstration imperfectly and in an inverted position.

The only other common type of Museum-case is the Pedestal-case; but for the purpose of the demonstrator this is usually not more favourably placed than is the wall-case. It appears, therefore, impossible to describe the contents of any glass case with advantage to a large party of visitors.

Probably the demonstrator himself in many cases hardly realizes the difficulty under which he labours. He, if no one else, has seen all that he has been talking about, from beginning to end of his discourse. Of his failure to reach the outskirts of his party, he remains practically ignorant.

If the demonstration has been given to a local Society, the President, or other representative, will probably have kept close to the speaker's elbow; and, having thus seen everything, he can conscientiously refer, in proposing the usual vote of thanks at the conclusion, to the great success of the demonstration.

At the same time, the outside members, sensible of their obligations to the Curator for his trouble, are too polite to murmur dissatisfaction; and so the lecturer, who has not really been heard perhaps by more than one-third of the party, leaves with the pleasing impression that all has passed off admirably.

The real difficulty can only be realized when the Curator comes down from his position as demonstrator, and attends similar demonstrations elsewhere. On doing this, I have been struck with the smallness of the number in a given party who can usually see well and hear well.

As a consequence of defective seeing and hearing, many of those on the outskirts of the party lose interest in the demonstration, and are led to chat together or straggle away from the demonstrator, each looking at the specimens which attract his own fancy.

I have been induced to bring the subject forward in order to ask the members of this Association whether they think the difficulties which have forced themselves upon my attention are real; and, if so, how they are in the habit of dealing with them.

After considerable experience, both as demonstrator and as listener, my own impression is that no demonstration ought to be attempted in a Museum if the party of visitors numbers more than about a dozen. But the demonstration should take the form of a lecture or lecturette, delivered in a separate room where all can be sure of hearing.

In this lecture-room or class-room typical specimens, brought from the Museum, could be well displayed during the lecturer's

description. But it seems to me far preferable not to disturb the Collections. My suggestion is rather that the typical objects upon which the demonstration is founded should be photographed from specimens in the Museum, and that lantern slides of these specimens, and not the objects themselves, should be exhibited on the screen during the demonstration. The camera and the lantern ought, in these days, to be adjuncts to every Museum.

Suppose that a local Natural History Society desires to visit the Museum. If the Curator would make the visit really profitable from an educational point of view, he will select one special group of objects for his lecture, rather than give a rambling demonstration on the general contents of the Museum. Let him select, for example, the Cephalopoda. He will prepare photographs of the typical Cephalopods in the Museum, and will exhibit them on the screen, together with other slides copied from standard works illustrating the subject, and will thus be able to explain the structure of these Molluscs in a way which he could never do when standing in the Museum in front of a case of empty shells and internal structures, even if these are accompanied (as they should be) by illustrative diagrams. It is true the visitor will not see the specimens themselves while the demonstration is proceeding, and will lose a good deal of the effect of colour, &c.; but, at the close of the demonstration, the Curator should proceed with his party to the Museum, and point out the actual specimens, which, however, will now need little or no further explanation from him. The visitors can inspect them at their leisure, the Curator having prepared them for the principal points of interest which the specimens present. It might be well to begin the demonstration by shewing a general photograph of the case or cases in which the Cephalopods are arranged, and thus the visitor would be able afterwards to recognize the cases even without the Curator's aid.

A demonstration of the kind suggested would obviously be a very different thing from an ordinary lecture, inasmuch as it would refer mainly to specimens in the collections, and would be illustrated by the adjournment to the Museum. The value of the Museum as an educational agent would thus be realized, and the

next time the visitor came to the institution he would find, even if ignorant of general Zoology, that the collection of Cephalopods was invested with an interest far beyond that which could have been derived from having heard an ordinary lecture on the subject outside the walls of the Museum.

DISCUSSION ON MR. RUDLER'S PAPER.

MR. HIGGINS admitted that the difficulty dealt with by Mr. Rudler was a real one, but he was disposed to extend Mr. Rudler's limit of a dozen to 40 or 50. He fully agreed with Mr. Rudler as to the undesirability of moving the specimens from the cases.

MR. HOYLE had met with all the difficulties mentioned by Mr. Rudler, and thought that the case was rather under-stated than over-stated. He warmly approved of the plan recommended in the paper, and considered both camera and lantern indispensible adjuncts to a Museum.

MR. PADEN said that he had found Museum demonstration much impeded by the crowding of visitors round the cases, and that he had often had to repeat his remarks two or three times to fresh detachments of visitors, who had been prevented from seeing and hearing by those in front.

MR. CARR gave an amusing account of his experience of Museum demonstrations in Nottingham. He had found the same difficulties as the lecturer and the previous speakers, and had hitherto met them by using a room for the demonstations instead of giving them in the Museum galleries. But he had not yet used the lantern, and was very grateful for the suggestion. He would also advise the use of a short syllabus, to be distributed among those attending the demonstration.

MR. OGLE was very glad to hear of the plan proposed by Mr. Rudler. At Bootle, specimens were taken out of the cases for demonstration, but even when that was done, only 30 or 40 people could be dealt with at one time.

MR. STORRIE said that he had adopted with success the plan of illustrating the cases by microscope preparations and slides: these should be carefully studied before the demonstration.

MR. SHRUBBS spoke of the great usefulness of the lantern in the lectures and demonstrations, and said that it had been for some time the practice to use lantern-slides with lime-light, even in the day-time, in Cambridge lecture rooms.

MR. PATON admitted the use of occasional demonstrations, but pointed out the danger of the Curator degenerating into a guide if demonstrations became frequent.

MR. CAMERON said he had found that teaching was best accomplished by lectures, &c. outside the Museum, supplemented by walks through the galleries. Demonstrations, in the ordinary sense of the term, seemed scarcely necessary.

MR. HOWARTH maintained the great superiority of demonstrations illustrated by lantern slides over those given before the cases, and spoke in high praise of Mr. Rudler's method.

THE FOSSIL CRINOIDEA IN THE BRITISH MUSEUM.

[*An attempt to put into practice modern ideas of Museum arrangement.*]

BY

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"A well-arranged educational Museum has been defined as a collection of instructive labels illustrated by well-selected specimens."

"What is, or should be, the order of events in arranging a portion of a public Museum? First, as I said before, you must have your Curator. He must carefully consider the object of the Museum, the class and capacities of the persons for whose instruction it is founded, and the space available to carry out this object. He will then divide the subject to be illustrated into groups, and consider their relative proportions, according to which he will plan out the space. Large labels will next be prepared for the principal headings, as the chapters of a book, and smaller ones for the various sub-divisions. Certain propositions to be illustrated, either in the structure, classification, geographical distribution, geographical position, habits, or evolution of the subjects dealt with, will be laid down and reduced to definite and concise language. Lastly will come the illustrative specimens, each of which as procured and prepared will fall into its appropriate place. As it is not always easy to obtain these at the time that they are wanted, gaps will often have to be left, but these, if properly utilised by drawings or labels, may be made nearly as useful as if occupied by the actual specimens."

These words are taken from the Presidential Address of Prof. W. H. Flower to the British Association at Newcastle-on-Tyne in 1889. The following detailed account of the arrangement of the Fossil Crinoidea in the British Museum (Natural History), which

I am allowed to give by the kind permission of Dr. Henry Woodward, F.R.S., Keeper of the Geological Department, may be of interest, first as showing that the above directions, though ideal, are not utopian; secondly, as a slight help to those on whom the task of displaying similar collections devolves.

Before describing the arrangement adopted, it will be well to consider the various points alluded to by Professor Flower, just as they had to be considered before a single specimen was mounted.

First, the object of the Natural History Museum. On this point it would be as unbecoming in one who is merely a Junior Assistant to express any opinion, as it would be culpable in him to be without one. It is, fortunately, enough for our purpose again to quote Professor Flower,† this time writing as Director of our National Museum. The object is twofold: (1) the *diffusion* of scientific knowledge, (2) the *advancement* of the same. In accordance with these two ends the collections are divided into an exhibited portion, visible to all, and a reserve portion, kept in drawers or in private rooms, to be "used for consultation and reference by duly accredited students."

Our present concern is solely with the exhibited specimens, and the second question to be answered is:—for whose instruction are they intended? In other words, who are the visitors to the Museum? We may at once set aside specialists, children of less height than the Table-cases, and the nurse-maids who do or sometimes, unfortunately, do not accompany the latter. The remainder may be classed as follows:—

1. The British public and Foreign tourists.
2. Those wishing to see "curiosities" of which they have read.
3. Collectors wishing to name specimens.
4. Students of Science (not specialists).

CLASS 1. forms the great majority. For them are intended the Mammoth, the Mastodon, the Megatherium, and the mighty masses of fossiliferous matrix. It is almost impossible, by any

† A general guide to the British Museum (Natural History), &c., 1888, p. 18.

means short of fireworks, to attract their attention to fossils less than a yard in diameter; nor indeed is it at all necessary to do so. The only specimens among the Crinoidea worthy of their notice are a large slab of polished mountain limestone, which, despite all labels hitherto invented, they persist in regarding as a fine work of art (presumably mosaic), and a magnificent colony of *Extracrinus* from Würtemberg, which it is impossible to persuade them does not represent ferns and flowers. The treasures of a collection like that in our vast museum can never be properly brought to the notice of these Gallios without a system of lectures like those described at our last meeting by Mr. R. Paden. At present it is only private institutions or individuals that attempt to meet this want; whether it would be expedient or possible to add oratory to the duties of civil servants must be left for the State to decide.

CLASS 2 is more interesting. It consists of young ladies' seminaries, intelligent schoolboys, and self-educated artisans. They, however, need not be specially considered in the labels or in the methods of exhibition, for they generally know what they wish to see, and all they want is to find where it is. Flies in amber, Eozoon, the fossil man, Archaeopteryx, the evolution of the horse, quite the oldest known fossils: such are the objects that an assistant found in the public galleries is often requested to point out. These are the people one would like to encourage, but one sorrows to think how often they are compelled merely to ask a policeman.

CLASS 3, the collectors, require very special consideration. It may be taken as an axiom that any man having found a British fossil, of a described species, should be able, by coming to the National Museum, to find out the correct name of that fossil. This end he might, no doubt, attain by ringing the bell and asking to see an assistant. At the same time, with so limited a staff, it would not be possible for the Department to undertake the naming of all the fossils so brought into the building, nor would the taxpayer wish it to name dealers' specimens gratis. Even if this could be done, the bringers of fossils would depart merely with a Latin (or dog-latin) name, but in no sense better or wiser than

before. It is, therefore, necessary that every British species should be exhibited, and in those instances where the Museum does not possess a specimen, either a cast or a drawing of the type, or, still better, of a typical specimen, should be set out until it can be replaced by an actual fossil. One must, of course, assume in the members of this class a certain degree of intelligence, but, even so, it may be questioned whether a simple mounting of however large a number of individuals of each species would be enough; even a specialist finds it hard to see differences between species by cursory inspection, while the ordinary person is confused rather than helped by a mass of material.

As to foreign specimens, we may take it that the collector very rarely wants to see these. The man that wishes to compare British species with those from other lands must be treated as an original worker or specialist. The conditions at present obtaining in the Natural History Museum would render it impossible to exhibit every known species, at least so that it could be seen; and whether anything, beyond the gratification of national pride, would be gained by such waste of labour and space, has already been answered in the negative by the highest authority.*

CLASS 4 has thus been described by Professor Flower †:—"There is another and a far larger class to whom Museums are or should be a powerful means of aid in acquiring knowledge. Among such, those who are commencing more serious studies may be included; but I especially refer to the much more numerous class .....who, without having the time, the opportunities, or the abilities to make a profound study of any branch of science, yet take a general interest in its progress, and wish to possess some knowledge of the world around them and of the principal facts ascertained with regard to it, or, at least, some portions of it. For such persons Museums may be, when well organised and arranged, of benefit to a degree that at present can scarcely be realised." In this class are included a large number of students from the neighbouring scientific institutions, such as the Royal

* Flower, Brit. Assoc. Report, 1889, p. 14.
† *Op. cit.* p. 13.

College of Science, and many students from other London Colleges (University, King's, Bedford, &c.): in the vacations these are replaced by occasional students from Oxford, Cambridge, and other Universities, and by school-teachers, many of whom come to the Royal College of Science for a Summer course; while all through the year is a small stream of other country workers—Museum curators and general geologists—who wish now and again to freshen their knowledge, and to keep in the mid-stream of scientific progress. For these, a great national institution such as the Natural History Museum should be a centre of enlightenment, a sure guide in all their doubts. Only satisfy these, and the knowledge and enthusiasm that they acquire will be speedily communicated to others. It is in the relative magnitude and importance of this class of its visitors that a metropolitan Museum differs so markedly from any provincial one, however large or however rich the latter may be. It is, therefore, in the due recognition of the needs of this class that the Natural History Museum will best fulfil the second of its great objects, namely, the diffusion of knowledge.

Having considered the classes and capacities of the visitors to the Museum, and having discovered their wants, we have still to notice what limitations are imposed on us in attempting to fulfil those wants.

First, the space allotted to the stationary Echinoderms is as follows:—

(*a*). 9½ frames of Table-case 2′ 1½″ deep, 3′ 9″ wide.

(*b*). Wall space at back of Wall-cases:—

(i.) 3′ 2″ high, 15′ 6″ long.

(ii.) 8′ high, 17′ long.

(*c*). Sloping Shelves in Wall-case, all 13′ 6″ long:—

(i.) A few inches off ground, 3′ deep.

(ii.) At mid-height, 2′ 2″ deep.

(iii.) At height of eye, 2′ 6″ deep.

(*d*). Flat shelf at back of *c* ii., 15′ long, 9″ deep.

(*e*). Flat triangular shelf at end of *c* i., with a base of 2′.

(*f*). Sloping triangular shelf at end of *c* ii., with a base of 2′.

Secondly, it is a rule of the Department that the table-cases should be reserved for British, the wall-case shelves for Foreign specimens; this political separation is useful to the collector, and, if cross-reference labels be adopted, need present no serious difficulty to the student. In the explanatory series, however, it was found impossible to illustrate the text by British specimens alone, and the rule has been broken. On the other hand, many British specimens, which are too big to go in the table-cases, have been relegated to the wall cases. These mostly illustrate the colonial habit of crinoids, and, since the slabs often contain more than one genus, they could not have been placed in the systematic series. Here, again, cross-references are useful.

Another rule of the Department may also be regarded as a concession to the collector; namely, the precedence of a stratigraphical over a zoological arrangement of Orders, Families, and Genera. The value of this disposition is best seen in groups so numerous in species as the Cephalopoda, the Brachiopoda, and the Echinoidea: the only probable objector to it is the student who would trace the evolution of a genus or a family; so long, however, as its visitors include folk who will not look at a fossil for fear of disturbing their faith, it is not to be expected that a State Museum should lend itself to anything that makes for so unsound a hypothesis as that of descent with modification.

In accordance with the above limitations the space has been thus apportioned:—

(*a*) Explanatory series - - - - 1 frame.
British Silurian Crinoids - - 2½ ,,
,, Devonian ,, - - - ½ ,,
,, Carboniferous ,, - - - 2 ,,
,, Secondary ,, - - - 1⅔ ,,
,, Tertiary ,, - - - ⅓ ,,
,, Cystidea - - - - ¾ ,,
,, Blastoidea - - - - ¾ ,,

(*b*) i. 19 slabs of British and Foreign Crinoidea in moveable frames.

ii. 20 slabs ditto, one of which—the *Extracrinus* colony from Würtemberg—is about six feet square.

(*c*) i. Smaller slabs, chiefly British, not in frame: put here because they are too big to go anywhere else; the back part of the shelf, for about a foot, is in deep shadow, but even in front the specimens cannot be well seen.

ii. Foreign Cystidea 3′4″
,, Blastoidea 2′8″
,, Silurian and Devonian Crinoidea occupy the rest.

iii. Foreign Carboniferous Crinoidea 8′6″
,, Triassic ,, 8″
,, Secondary ,, 3′6″
,, Tertiary ,, 8″

(*d*) Large specimens mounted on blocks; Cystidea, Blastoidea, and Crinoidea. These are in deep shadow. Everyone knows that these wall-cases are absolutely unsuited for displaying invertebrate fossils; but then everything cannot be perfection even in a Government office.

(*e*) Spirit specimens of recent Crinoidea, to remind visitors that the fossils were once alive.

(*f*) A small series of rock-specimens of crinoidal origin.

There are besides hung on the wall a large slab of polished mountain limestone (Crinoidal Marble) and a weathered slab of Silurian limestone from Gotland showing crinoid stems in relief.

Upon each table-case, and at the top of each door of the wall-cases, is a conspicuous label giving, in Latin or English, the name of the class to be seen below.

DETAILED DESCRIPTION OF THE ARRANGEMENT.

Entering the Gallery, the visitor has on his right the cases containing the Echinodermata, and his eye is immediately caught by the following label fixed to the wall:—

ECHINODERMATA.

The ECHINODERMATA form one of the great groups of the Animal Kingdom (corresponding to the Mollusca, Vertebrata,

Arthropoda and others): they include Sea-urchins, Star-fish, Sea-cucumbers and other less well-known marine animals.

The name, derived from ἐχῖνος *a hedgehog* and δέρμα *skin*, is given to these animals because their skin is strengthened by a crystalline deposit of Carbonate of Lime: this deposit, when seen under a microscope, presents a peculiar net-like appearance; it may remain in the form of minute separate spicules (as in HOLOTHUROIDEA), or some of it, by forming larger rods and plates, may give rise to a continuous skeleton (as in all other Classes of the group). The walls of some of the internal organs are often strengthened by a similar lime-deposit.

In the ECHINODERMATA nearly all the organs of the body are arranged in a radiating manner around a central axis, in such a way that the animal can be divided into *five* similar portions. This radiate symmetry must not be confused with that seen in Corals and Jelly-fish, since the Echinoderms differ from those animals in having, as in all higher groups, their digestive apparatus in the form of a *gut* entirely shut off from the main body-cavity, while a system of branched tubes carries *blood* through the body.

Echinoderms are specially characterised by a system of sacs, canals and tubes that carry *water* through the body and serve purposes of respiration or locomotion or both.

With the exception of a few forms found in brackish water, all Echinoderms live in the *Sea*, where they occur either near the surface or on the bottom at all depths. This fact, combined with the presence, in most of them, of an easily preserved skeleton, renders them important to the Geologist; and their *fossil* remains occur in rocks of every age in which animals are known to have existed.

The Echinodermata may be divided into the following Classes:—

HOLOTHUROIDEA" "Sea-cucumbers:" see Table-case 78, Wall-case.

CYSTIDEA, an extinct class: Table-case 75, Wall-case 18.

CRINOIDEA, "Lily-animals" and "Feather-stars:" Table-cases 73, 74, Wall-cases 16, 17, 18.

BLASTOIDEA, an extinct Class: Table-case 75, Wall-case 18.

ECHINOIDEA, "Sea-urchins:" Table-cases 76, 77, 78, Wall-cases 15, 16, 17.

ASTEROIDEA, "Star-fish:" Table-cases 75, 76, Wall-cases 15, 17.

OPHIUROIDEA "Brittle-stars:" Table-case 75, Wall-case 17.

Before examining the fossil Echinoderms, the visitor is recommended to study the anatomy of the soft parts and the development in the Echinoderms now living, which are exhibited on the other side of the building in the Starfish Gallery of the Zoological Department. A Guide to that Gallery may be purchased at the entrance to the Museum.

Having read this, the visitor is expected to examine the table-cases in order, working from left to right; thus he comes to the Crinoidea, and in them first to the **Explanatory Series.** This is designed to exemplify the main facts in the structure of the crinoids, with some attention to their physiology and relations to environment. Owing to the separation of the recent from the fossil forms, it is difficult to accomplish this in a satisfactory manner, and something must of course be left for the Index Museum in the Central Hall. Here, therefore, special attention has been paid to the parts likely to be preserved in a fossil state. It will be noticed that the consecutive labels form a continuous text to which the specimens and drawings are merely illustrations; this is the reverse of the method usually adopted, but there can be no doubt that it is better suited for giving information of the kind in question. The labels are written in "definite and concise language," which persons of ordinary education, but with very slight scientific knowledge, have found intelligible. It must be remembered that these labels are not intended so much for Classes 1 and 2 of Visitors as for Class 4. The tablets are numbered, so as to facilitate cross-reference, and are arranged in ten columns, which are separated from each other by a thin black rod. The labels are here reprinted, and above each is stated the nature of the illustration, whether specimen or drawing: on the right hand side is stated the depth of each tablet; the breadth in every case is 4 inches.

1. [Specimens.] 2½ in.

PARTS OF CRINOID SKELETON.

The Crinoidea possess a hard SKELETON of Carbonate of Lime, composed of many separate PLATES and OSSICLES. It is these parts that are preserved in the Fossil state.

Examples: STEM-OSSICLES OF (a) RHODOCRINUS AND (b) ENCRINUS, CALYX-PLATES OF (c) ENCRINUS AND (d) MARSUPITES, ARM-OSSICLES OF (e) PENTACRINUS.

2. [Drawings (a) after P. H. Carpenter, Chall. Rep. Stalked Crinoids, Pl. v. f. 8. (b) Ibid. f. 6.] 2¾ in.

MICROSCOPIC STRUCTURE OF SKELETON.

These Plates are formed, as in all Echinoderms, of a fine MESHWORK of Carbonate of Lime, deposited in organic tissue. Fig. a shows a solid block of this, seen by reflected light (×60 diameters). Fig. b shows the reticulate appearance of a thin-ground section, seen by transmitted light (×45 diameters).

3. [Specimens.] 3 in.

CLEAVAGE OF FOSSIL CRINOID PLATES.

In process of petrifaction the spaces in the minute meshwork are usually filled with crystalline Carbonate of Lime (Calcite). Hence the resulting fossil substance CLEAVES EASILY, in planes parallel to the faces of a rhombohedron as does all Calcite. The original structure is sometimes, but not always, obliterated.

Examples: (a) BROKEN CRINOID-STEM, CARBONIFEROUS LIMESTONE, (b) CRYSTAL OF CALCITE (ICELAND-SPAR), CLEAVED.

4. [Specimen.] 3 in.

PETRIFACTION BY SILICA.

The spaces in the meshwork may be filled with SILICA, and the original lime-substance subsequently dissolved. Or Silica may be *substituted* for the original substance. The minute structure is generally obliterated, but canals and internal organs are often preserved by this process. The specimen exhibited shows, where broken, the conchoidal fracture of Silica.

Example: AGARICOCRINUS, CARBONIFEROUS, ILLINOIS.

5. [Complete Specimen lying on matrix. The words CROWN, STEM and ROOT affixed to the regions in question.] 8 in.

A TYPICAL CRINOID.

Normally a Crinoid consists of a CROWN attached by its Dorsal (i. e. Aboral) extremity to a STEM which is fixed to some solid body by a ROOT.

Example: TAXOCRINUS TUBERCULATUS, WENLOCK LIMESTONE.

6. [Drawing, reconstructed from P. H. Carpenter, Quart. Journ. Geol. Soc., vol. xxxviii. Pl. i., and from actual specimens.] 3½ in.

FREE STALKED CRINOIDS.

The Root is absent in a few forms, and the Stem tapers to a point. The animal anchors itself by the Stem, or swims freely.

Example: MILLERICRINUS PRATTI, OOLITE, ENGLAND.

7. [Drawing after P. H. Carpenter, Chall. Rep. Stalked Crinoids, Pl. ii., left hand figure.] 3 in.

SESSILE CRINOIDS.

The Stem is absent in a few forms, and the Crown is fixed by its Base.

Example: HOLOPUS, RECENT.

8. (a) [A dried specimen. (a) 3 in.
(b) Drawing, reconstructed from figures by Dr. W. B. Carpenter and others.] (b) 3in.

UNSTALKED FREE CRINOIDS.

Both Stem and Root are absent in a few forms, and the Crown swims freely. In the Larva however of the only such form of which the early stages are known the Stem is still present.

Examples: (a) ANTEDON BIFIDA, RECENT.
(b) FIGURE OF ITS LARVA, THE SO-CALLED "PENTACRINOID."

9. [Specimens, to the different parts of which the words CALYX, ARMS and DORSAL CUP are affixed.] 4 in.

THE CROWN.

The Crown is the essential part of a Crinoid. It consists of a CALYX, containing the Viscera, and of 5 ARMS, which may be more or less branched. The arms collect food, bear the generative products, and, in free forms, aid locomotion. That part of the Calyx below the arm-bases is called the DORSAL CUP: in the fossil state it is more frequently preserved than any other part of the Crown. In specimen (a), as in most fossil Crinoids, the ventral portion of the Calyx is hidden by the arms.

Ex.: (a) PLATYCRINUS HEMISPHERICUS, CARBONIF. INDIANA,
(b) PLATYCRINUS GIGAAS, CARBONIFEROUS, ENGLAND.

10. [Specimens: (a) Seen from oral, (b) and (c) from aboral surface.] 4 in.

PENTAMERISM OF CRINOIDEA.

The Crinoids, like other Echinoderms, have a RADIATE STRUCTURE of which 5 is the dominant number. Typically the Skeleton is divisible into 5 corresponding and symmetrical sections—PENTAMERES, by 5 imaginary planes starting from the Dorso-ventral axis. These RADIAL PLANES, of which the outlines are marked in red on the specimens, invariably pass through the origins of the Arms.

Ex.: (a) ACTINOCRINUS STELLARIS, CARBONIFEROUS, BELGIUM,
(b) ACTINOCRINUS POLYDACTYLUS, CARBONIF., YORKSHIRE,
(c) TAXOCRINUS MEEKI, CARBONIF., INDIANA, U.S.A.

11. [Specimen; and Drawing—an analysis of the cup, similarly coloured.] 3 in.

THE DORSAL CUP (MONOCYCLIC BASE).

In its simplest form the cup is composed of 2 circlets of 5 plates. The circlet next the stem is the BASE; its plates are called BASALS (coloured blue on specimens). The plates of the succeeding circlet, which bear the arms and which are therefore bisected by the radial planes, are called RADIALS (coloured red on specimens). The Basals alternate in position with the Radials, that is they are interradially situated. When, as here, the Base is formed of only one circlet of plates it is said to be MONOCYCLIC.

Example: IOCRINUS CRASSUS, SILURIAN, INDIANA.

12. [Specimen.] 2 in.

[The Radials and Basals are red and blue, as in 11.]

THE DORSAL CUP (DICYCLIC BASE).

Another circlet may occur *beneath* the Basal circlet. The plates of this circlet are called INFRABASALS or UNDERBASALS (coloured yellow on specimen); they alternate with the Basals, that is they are radially situated. Whenever Infrabasals are present the Base is said to be DICYCLIC.

Example: CYATHOCRINUS, CARBONIFEROUS, ENGLAND.

13. [(a) Drawing, after P. de Loriol, Paléont, Française, Jurassique, Crinoidea. Pl. cx., fig. i. a. 3½ in.

(b) Drawing, after H. Bury, Phil. Trans. clxxix. Pl. xlvi. fig. 46.

Both drawings diagrammatically coloured.]

THE DORSAL CUP (PSEUDO-MONOCYCLIC BASE).

The Infrabasals may be so diminished as to be quite invisible on the exterior of the cup, or they may be present only in Larval stages. Such forms *appear* Monocyclic, but *are really* Dicyclic.

Examples: (a) MILLERICRINUS POLYDACTYLUS, JURASSIC, FRANCE,

(b) EARLY STAGE OF LARVA OF ANTEDON, RECENT.

14. [Specimen, diagrammatically coloured.] 2½ in.

THE DORSAL CUP (BASE).

The Basals, or Infrabasals when present, may, by the fusion of two pair, become 2 *large* and 1 *small*, instead of 5 equal plates. The small Infrabasal is usually anterior, and the small Basal is often in the left anterior interradius.

Ex.: PLATYCRINUS MICROSTYLUS, CARBONIF., YORKSHIRE.

15. [Specimen, diagrammatically coloured.] 2 in.

THE DORSAL CUP (BASE).

The small plate may increase in size, while the others decrease, so as to result in a Base of 3 *equal plates*.

Example: ACTINOCRINUS, CARBONIFEROUS, YORKSHIRE. [57813]

16 [Specimen, diagrammatically coloured.] 2 in.

THE DORSAL CUP (BASE),

Fusion of only 2 Basals, will produce a Base of *four plates*.

Example: MELOCRINUS GIBBOSUS, DEVONIAN, EIFEL.

17. [Specimen (plaster cast), diagrammatically coloured.] 2½ in.

THE DORSAL CUP (BASE).

Further fusion may similarly produce only *two* Basals of equal size

Ex.: DICHOCRINUS CONTRACTUS, CARBONIF., ENGLAND.

18. [Drawing, after P. H. Carpenter, Chall. Rep. Stalked Crinoids, Pl. viii. a., fig. 1.] 3½ in.

THE DORSAL CUP (BASE).

The Basals may completely fuse, so as to form one solid ring.

Example: BATHYCRINUS GRACILIS, RECENT.

19. [Three Specimens, diagrammatically coloured.] 2 in.

THE DORSAL CUP (BASE).

The Basals may be overgrown by the Radials, and may entirely disappear in the adult.

Example: EUGENIACRINUS, JURASSIC, GERMANY.

20. [Specimen. diagrammatically coloured, and with the symbols written on the plates.] 4 in.

THE DORSAL CUP (FIXED BRACHIALS).

Some plates, originally developed as Arm-ossicles, or BRACHIALS (Br.) may come to form part of the cup. The plates of the 1st order continuing the line of the radials are called PRIMIBRACHS (1 Br). The plate on which branching of the ray takes place, in this case the Second Primibrach is called AXILLARE (Iax.)

Example: APIOCRINUS, OOLITE, WILTSHIRE.

21. [Specimen; the ossicles of one arm distinguished by different shades of red and by affixed symbols.] 4 in.

THE DORSAL CUP (ORDERS OF BRACHIALS).

A still greater number of Brachials may be included in the cup. In this case each ray will usually *branch* within the cup, thus doubling the number of brachials in the upper circlets. This branching may take place more than once, and the plates will be distinguished as follows:—The 1st order PRIMIBRACHS (1Br.); 2nd, SECUNDIBRACHS. (11Br.); 3rd, TERTIBRACHS (111Br.); 4th, QUARTIBRACHS (IvBr.); and so on. The radials and the brachials of all orders in any one series constitute a RADIUS or RAY.

Ex: ICHTHYOCRINUS PIRIFORMIS, WENLOCK LIMESTONE.

22. [Specimen, diagrammatically coloured.] 2½ in.

THE DORSAL CUP (INTERBRACHIALS).

Plates may also be developed *between* the Rays. Such plates are called INTERBRACHIALS (coloured brown in specimen). They vary in number greatly in different genera, somewhat in different species of a genus, slightly in different individuals of a species, and may even vary in the different interradii of an individual.

Example: AMPHORACRINUS, CARBONIFEROUS, YORKSHIRE,

23. [Specimen, diagrammatically coloured.] 4 in.

THE DORSAL CUP (INTERSECUNDIBRACHS.)

When Radii branch within the cup, plates often occur between the two rows of Secundibrachs in each radius; they are called INTERSECUNDIBRACHS (i11Br). Similar plates between Tertibrachs are called INTERTERTIBRACAS (i111Br). (These plates are coloured purple in the specimen).

Example: SAGENOCRINUS EXPANSUS, WENLOCK LIMESTONE.

24. [Specimens, diagrammatically coloured.] 3½ in.

THE DORSAL CUP (ANAL PLATES).

The Interradius in which the Anus is placed is often widened for the accommodation of that organ by the shifting and modification of Interbrachials, when present, and by the addition of special plates. Thus the POSTERIOR INTERRADIUS is manifested, and an anteror, posterior BILATERAL SYMMETRY is superinduced on the primitive pentamerism of the Dorsal cup. All plates in the Posterior Interradius are called ANALS (coloured green in the specimen): they occur chiefly in Palaeozoic Crinoids.

Examples: (a) HEXACRINUS ORNATUS, DEVONIAN, EIFEL,
(b) AMPHORACRINUS, CARBONIFEROUS, ENGLAND

25. (a) Specimen. 4½ in.
(b) [Drawing, after P. H. Carpenter, Chall. Rep. Stalked Crinoids. Pl. lxii.]

THE CHAMBERED ORGAN.

This organ, peculiar to Pelmatozoa, lies in a cavity where the Calyx joins the Stem (as shewn in specimen). It consists of a central axis of 5 blood-vessels (v) surrounded by 5 other vessels which expand into 5 large chambers (ch). It is enclosed in a fibrous envelope or CAPSULE (ca), which serves as a *nerve-centre* governing the Arms.

Examples: (a) APIOCRINUS. OOLITE, BRADFORD,
(b) SECTION THROUGH LOWER PART OF CUP OF PENTACRINUS DECORUS, RECENT.

26. (a) [Specimen; beautifully weathered, with bristles passed along the canals. 3½ in.
(b) Drawing, with the names of the different canals affixed.]

THE DORSAL NERVOUS SYSTEM.

Fine branching extensions of the Capsule AXIAL-CORDS, serve as sensory and motor nerves. In most recent Crinoids they lie in CANALS that pierce the plates of the Dorsal Cup and the Arm-ossicles. These canals are sometimes clearly weathered out in silicified fossils.

Example: (a) MILLERICRINUS, OOLITE, WURTEMBERG.
(b) DIAGRAM OF CANALS IN THE SAME.

27. [Drawing, after P. H. Carpenter, Chall. Rep., Stalked Crinoids, Pl. viii. a, fig. 5; diagrammatically coloured.] 6 in.

THE ARMS.

The Arms are supported by a series of OSSICLES. On the upper or ventral surface is the FOOD-GROOVE (fg), lined with fine vibratile filaments—CILIA, which direct a stream of water towards the Mouth. Between the groove and the ossicle run extensions of the various systems of the body, viz., a NERVOUS BAND (n), a BLOOD-VESSEL (b) a WATER-VESSEL (w) which gives off tubes to the tentacles, a COELIAC (cc) and 2 SUBTENTACULAR (stc) canals from the body cavity, and a canal containing the GENITAL CORD (gc). The centres of the ossicles are pierced by the Axial Cord, from which branches pass to the muscles that unite the arm-ossicles, and thus the movements of the arms are controlled.

Example: SECTION THROUGH MIDDLE OF ARM-JOINT OF BATHYCRINUS ALDRICHIANUS, RECENT.

28. [(a) Specimen. 4 in.
(b) Original Drawing.
(c) Drawing, after P. H. Carpenter, Chall. Rep. Stalked Crinoids. Pl. liv., fig. 9.]

THE ARMS.

The Food-groove is fringed by TENTACLES (T), which subserve respiration, and is bordered by small COVERING-PLATES (cp), which can, on occasion, close over it.

Ex.: (a) ARM OF CYATHOCRINUS SQUAMIFER, WENLOCK LIMEST.
(b) DRAWING OF SAME × 8 DIAM.
(c) SIDE-VIEW OF PINNULE OF ANTEDON BASICURVA × 30 DIAM.

29. [Specimen.] 2¼ in.

SIMPLE ARMS.

Each Arm-skeleton begins, strictly speaking, with the first Primibrach and primitively consists of a single series of ossicles continuing the line of the Radial. This produces 5 SIMPLE, UNISERIAL ARMS.

Example: SYMBATHOCRINUS, CARBONIFEROUS, IOWA.

30 [Specimen.] 4½in.

SIMPLE ARMS.

Usually each Arm splits into 2 main branches; the first Axillare [see Tablet 20], or Primaxit, is in this specimen the second Primibrach. Each branch may again divide more than once. This is DICHOTOMOUS BRANCHING of a simple, uniserial arm.

Ex.: GISSOCRINUS GONIODACTYLUS, WENLOCK LIMESTONE.

31 [Drawing, after N. P. Angelin, Iconogr. Crinoideorum; Pl. xx., fig. 8.] 4½in.

SIMPLE ARMS.

The Dichotomy may be less regular, or the branches, now on one side now on the other, may be smaller than the main arm. They are then called ARMLETS, and may themselves branch.

Ex.: BOTRYOCRINUS RAMOSISSIMUS, SILURIAN, GOTLAND.

32 [Specimen.] 2½in.

SIMPLE ARMS.

The Armlets may come to lie closer together and be regularly arranged on opposite sides of alternate joints.

Ex.: BOTRYOCRINUS DECADACTYLUS, WENLOCK LIMESTONE.

33 [Specimen.] 3½in.

PINNULATE ARMS.

When these side-branches become quite small in comparison with the main Arm, cease to branch themselves, and are regularly arranged, they are called PINNULES.

Ex.: SCYTALECRINUS, CARBONIFEROUS, INDIANA.

34. [(a) Drawing, after H. Ludwig, Zeitschr. für Wiss. Zool. xxviii., Pl. xiii., fig. 10. 4½in.
(b) Drawing, after P. H. Carpenter, Chall. Rep. Stalked Crinoids. Pl. liv., fig. 2.]

PINNULES.

Pinnules differ neither in structure nor in function from the rest of the Arm, except that in them the Genital products are ripened and protected. But this must also have been the case in the terminal branches of a Simple Arm.

Ex.: (a) CROSS-SECTION OF PINNULE OF ANTEDON ESCHRICHTI [FOR LETTERING SEE TABLET 27.]
(b) SIDE VIEW OF GENITAL PINNULE OF ANTEDON ACOELA.

35. [Specimen]. 4in.

PINNULATE ARMS.

A Pinnulate Arm may continue to branch in the same dichotomous manner as a Simple Arm.

Ex.: WOODOCRINUS AEQUALIS, CARBONIF. INDIANA.

36. [Specimen: some large arms with the parts lettered.] 4½in.

PINNULATE ARMS.

The main Arm (A) may bear pinnulate Armlets (a).

Ex.: EXTRACRINUS FOSSILIS, LIAS, LYME REGIS.

37. [2 Specimens and 4 original Diagrams.] 2½in.

PINNULATE ARMS.

Since in these arms each ossicle is originally an axillare, the ossicles tend to assume a *wedge-shape*. In process of growth, of either the individual or the race, a complete wedge-shape is assumed, so that the joint-lines between the ossicles form a ZIGZAG.

Ex.: PLATYCRINUS BURLINGTONENSIS, CARBONIF. IOWA.

38. [Specimen.] 5 in.

PINNULATE ARMS.

Lastly the ossicles come to lie in 2 alternating rows, in which case the Arm is said to be BISERIAL. This development doubles the number of pinnules in a given length of arm, and thus aids the collection of food-particles.

Ex.: ENCRINUS, MUSCHELKALK, BRUNSWICK.

39. [Drawing, after P. H. Carpenter; Chall. Rep. Comatulæ. Pl. xlvi., fig. 2.] 4½ in.

THE ORAL SURFACE.

The Ventral surface of the Calyx is covered with membrane—PERISOME, in which plates may be formed. The MOUTH is in the centre; the ANUS is in the Posterior Interradius. The food-grooves continue from the Arms to the Mouth.

Ex.: ANTEDON REGALIS, RECENT.

40. [Drawing, after P. H. Carpenter; Chall. Rep. Stalked Crinoids. Pl. vi., fig. 4.] 3½ in.

ORAL SURFACE (ORALS).

Typically the Mouth is surrounded or covered by 5 plates, interradially placed, called ORALS, between or beneath which the food-grooves pass. In Pentacrinidæ and Comatulidæ these plates are only seen in the young stages.

Ex.: HYOCRINUS BETHELLIANUS, RECENT.

41. [Drawing, after P. H. Carpenter; Chall. Rep. Stalked Crinoids. Pl. liv., fig. 11.] 2½ in.

ORAL SURFACE (FOOD-GROOVES).

The grooves are protected by COVERING PLATES (cp) which may be moveable; these are often supported on ADAMBULACRAL or SIDE-PLATES: beneath the grooves are irregular SUBAMBULACRAL plates.

Ex.: CROSS-SECTION OF AMBULACRUM OF ACTINOMETRA SOLARIS, RECENT.

42. [Specimens, with canals, anus and mouth indicated in (a) by wire; in (b) by affixed labels.] 3½ in.

THE ORAL SURFACE (FOOD-CANALS).

In some heavily-plated Palaeozoic Crinoids the grooves are depressed below the general surface and covered over forming CANALS (a). In some fossils these canals have been filled with matrix, and, when the covering is removed, are seen as casts (b).

Ex.: (a) BATOCRINUS, CARBONIFEROUS, IOWA.
(b) ACTINOCRINUS, CARBONIFEROUS, YORKSHIRE.

43. [Drawing, after P. H. Carpenter; Chall. Rep. Stalked Crinoids. Pl. xvii., fig. 6.] 4 in.

THE ORAL SURFACE (INTERRADII).

The plates in the spaces between the grooves are called ANAMBULACRAL. They vary from mere granules to thick solid plates. Some or all of them may be pierced by WATER-PORES, which admit water to the body-cavity.

Ex.: PENTACRINUS WYVILLE-THOMSONI, RECENT. (× 6 diam.)

44. [Specimen, coloured diagrammatically, and with labels affixed.] 3 in.

THE ORAL SURFACE (ANAL INTERRADIUS).

The posterior interradius is often larger than the others, especially when the Anus is much developed, as was usually the case in the older crinoids. When the Anus, surrounded by solid plates, lies nearer the centre, then the posterior oral is shifted and lies between the four other orals immediately over the Mouth.

Ex.: DORYCRINUS, CARBONIFEROUS, IOWA.

45. [Specimen, with arms of one side dissected away exposing tube, with affixed labels.] 6 in.

THE ORAL SURFACE (ANAL TUBE).

The Anus may even become central; it is then supported at the end of a long tube, so that the excrement is carried away from the Arms.

Ex.: BATOCRINUS PIRIFORMIS, CARBONIFEROUS, IOWA.

46. [(a) (b) Specimens. 8 in.
(c) (d) (e) Drawings, after Meek and Worthen, Rep. Geol. Surv. Illinois, Vol. v. Pl. IX, figs. 7 *a*. 12 *b* and *c* 6 respectively.

THE DIGESTIVE TUBE.

The Gullet passes down from the Mouth to the bottom of the visceral cavity; the Gut then coils round in the direction of a watch-hand, passing up in one or more coils to the Anus. In some palaeozoic crinoids the tissue supporting the tube was calcified and is found as a CONVOLUTED PLATE.

Example: STROTOCRINUS, CARBONIFEROUS, IOWA.
(a) A SPLIT SPECIMEN, SHEWING THE PLATE IN SECTION, IN ITS NATURAL POSITION. (b) THE CONVOLUTED PLATE. (c) VIEW OF PLATE IN POSITION. (d) VIEW OF PLATE FROM BASE. (e) MINUTE STRUCTURE OF PLATE (× 4 DIAM).

47. Specimens. 2½ in.

THE STEM.

The Stem consists of numerous Columnals, which are circular *(a, b)*, pentagonal *(c)*, or elliptical *(d)* in outline. They are perforated centrally by a round *(a, c, d)* or pentagonal *(b)* AXIAL CANAL.

Examples: (a, b) GENERA UNCERTAIN, CARBONIF. ENGLAND.
(c) PENTACRINUS, LIAS, ENGLAND.
(d) PLATYCRINUS, CARBONIFEROUS, ENGLAND.

48. [Specimens, and a coloured explanatory diagram for (b).] 3½ in.

THE STEM.

The Ossicles are united by LOOSE SUTURE; fibrous organic tissue, usually concentrated in longitudinal bands, is continuous through their substance; the joint surfaces are ridged either radially, transversely, or in a star-pattern [see preceding Tablet]. This structure allows of a small amount of motion.

Example: PENTACRINUS, RECENT.
(a) THE STEM HAS BEEN PULLED ASUNDER SO THAT THE FIBROUS BANDS ARE DRAWN OUT.
(b) LONGITUDINAL SECTION, THE ORGANIC TISSUE STAINED RED.

49. [Specimen.] 4 in.

THE STEM.

In some genera the Stem is beset at intervals with CIRRI, which have same general structure as the Stem. In many Palaeozoic forms the Cirri are irregularly placed and are often branched.

Ex.: GENUS UNCERTAIN, WENLOCK LIMEST., DUDLEY.

50. [Specimen.] 7 in.

THE STEM.

In later genera, especially of the Pentacrinidæ, the Cirri are arranged in *verticils* of 5, and are simple.

Example: PENTACRINUS, RECENT.

51. [Specimen.] 2½ in.

THE STEM.

The Axial Canal contains an extension of the Chambered Organ, and gives off branches to the Cirri; thus all the stem-structures receive nutrition from the blood and have their movements controlled.

Ex : SECTION OF STEM, CARBONIFEROUS, YORKSHIRE.

Figd. Geol. Mag. 1873, Pl. xi., f. 1. *Presd. by J. Rofe, Esq.*

52. [Specimen, with cast of axial canal partly dissected out.] 2 in.

THE STEM.

The Axial Canal may, in the fossil state, become filled with sandy matrix; and this, when the external structure is destroyed, remains as an internal cast.

Ex.: GENUS UNCERTAIN, WENLOCK LIMEST., DUDLEY.

53. [Specimens.] 5 in.

THE STEM (GROWTH).

The Stem grows by the *intercalation*, at the end nearest the Crown, of fresh ossicles which gradually increase in size. Different regions of the same stem may present a very different appearance.

Example: PENTACRINUS, RECENT.

(a) UPPER PART AND (b) LOWER PART OF SAME STEM.

54. [Specimen.] 3 in.

THE STEM (ATTACHMENT).

The Stem may be attached to the sea-bed by an encrusting expansion of its lower part—ROOT; this is adapted to a rocky bottom.

Example: APIOCRINUS, BRADFORD CLAY, WILTSHIRE.

55. [Specimen.] 4 in.

THE STEM (ATTACHMENT).

Or the lower end of the Stem may branch out in a number of RADICULAR CIRRI; this is adapted to an oozy bottom.

Example: EUCALYPTOCRINUS, SILURIAN, INDIANA, U.S.

56. [2 Specimens.] 4½ in.

THE STEM (ATTACHMENT).

In some Crinoids the Stem tapers off at the end (a) and the animal moors itself temporarily by its cirri (b).

Ex.: GENUS UNCERTAIN, WENLOCK LIMEST., DUDLEY.

57. [Specimen.] 2 in.

THE STEM (ATTACHMENT).

When cirri are absent the tapering stem may itself be coiled round some foreign object, e. g., as in this case, the stem of another Crinoid.

Ex.: GENUS UNCERTAIN, WENLOCK LIMEST., DUDLEY.

58. [Specimen.] 2½ in.

PARASITES.

CAPULUS, a Gasteropod, often permanently attaches itself to the ventral surface of a flat-topped Crinoid; and there, with its mouth exactly over the anus, it lives on the excrement of the Crinoid.

Example: MARSUPIOCRINUS WITH CAPULUS HALIOTIS, SBY. SP. WENLOCK LIMESTONE, DUDLEY.

59. 2 [Specimens, and diagrammatically coloured copy of figure referred to.] 2½ in.

PARASITES.

Some CORALS have a habit of attaching themselves to Crinoid stems; the stem then grows out and covers up the Coral.

Example: CLADOCHONUS CRASSUS ON CRINOID STEM, CARBONIFEROUS, YORKSHIRE.

Figd. Geol. Mag. 1869, p. 352, f. 1. *Presd. by J. Rofe, Esq.*

60. [Specimen.] 5 in.

PARASITES.

Crinoids are also attacked, especially in their stems, by BORING SPONGES and WORMS; this causes a swelling of the stem (a). In the section an excavation is seen leading to the axial canal (b).

Ex.: GENUS UNCERTAIN, CARBONIFEROUS, YORKSHIRE.

Figd. Proc. N. H. S Glasgow, 1879, vol. IV., Pl. ii., f. 1.

Following on the explanatory series comes the **Systematic Series** of British Fossil Crinoids. The Crinoidea are not numerous enough to be divided into so many stratigraphical divisions as is profitable in the case of the Echinoidea: those at present adopted are Predevonian, Devonian, Carboniferous and Permian, Jurassic, Cretaceous, and Tertiary. Of these the Predevonian crinoids are partly displayed in a proper manner; all the others are as yet quite inadequately arranged. As regards Zoological classification, every attempt is made to adopt one in accordance with the most advanced views—so long as these appear reliable.

The Classification of the Crinoidea has been for some years, and still is, in a state of flux; but this would be no good reason for waiting idly till a definite arrangement had crystallised out. No one at least has yet placed the retardation of knowledge among the *objects* of a museum.

A classification once adopted, the different divisions, from Orders to Genera, are distinguished by bold headings: next to each of these comes a label giving, in terms already explained by the introductory series, a definition of the Order, Family, Sub-family, Series or Genus. The etymology and meaning of every name is also explained; and under the families and genera references are given to the chief sources of information. The definitions are descriptive rather than strictly diagnostic, and occasionally refer to the explanatory series. Under each genus special attention is paid either to the type species or to the most common British species. By means of thoroughly well-cleaned specimens, and by enlarged drawings of such parts as are too small to be clearly seen through the glass lid of the case, the main features in the structures of each genus are brought out, and attention is drawn to those characters by which the different species may be distinguished. Type specimens are exhibited, for these being fossil are not damaged by exposure to light, and indeed are often the only ones available; but, even when the Museum possesses very many specimens, no more are exhibited than are required to illustrate the above points. In a few instances only is it advisable to exhibit a large series, in order to trace the chief variations of form; thus of *Marsupites testudinarius* 18 specimens are exhibited, which show that the so-called species *M. ornatus*, *M. laevigatus, and M. Milleri* are connected by "almost as many gradations as there are specimens."

The following will serve as typical examples of the labels:—

INADUNATA: "not joined together;"

So called because neither interbrachials nor any plates above radials are included in dorsal cup; there may, however, be from 1 to 3 plates in the posterior interradius. The plates of the cup are united by close suture.

HETEROCRINIDAE.

The Heterocrinidae have a monocyclic base. A plate, supporting the ventral sac, descends into the anal interradius (Anal *x*). Some of the radials are often compound; the lower segment of the right posterior radial is that which in other families passes into the anal area (Radianal, R'). The arms, originally dichotomous, develope armlets and pinnules.

DECADOCRINIDAE.

The Decadocrinidae have a dicyclic base. In the earlier forms an anal *x* is always, and a radianal nearly always, present in the dorsal cup; in time a 2nd anal is added; in later forms all 3 plates gradually disappear. There is a tendency to the formation of armlets or pinnules on 10 main arms (whence the name).

BOTRYOCRINITES.

Botryocrinites have a broadly conical or shallow dorsal cup. The anal *x* is large, the radianal small and sometimes absent. The arms bear armlets, which in a few species have become pinnules.

BOTRYOCRINUS.

(Etym., Βότρυς, *a cluster*).

Infrabasals 5, Basals 5; 3 are hexagonal, the 2 posterior heptagonal. Radials 5, with concave articular facet. Anal *x* pentagonal, in line with radials. Radianal small, rhomboidal. 1 Br, from 1 to 6. Each ray divides into 2 main arms, which bear either armlets or pinnules (see Explanatory Series, Tablets 31, 32). Distal end of ventral sac usually curves posteriorly. Column round or slightly pentagonal, composed of thin ossicles.

Angelin: Iconogr. Crin. Suc., p. 24 (1878).
Wachsmuth & Springer: Revision I., p. 98 (1879).
Bather: Annals & Mag. N. H. [6] VII., p. 389. May, 1891.

The following labels show how the genus Cyathocrinus is illustrated:—

CYATHOCRINIDAE.

The Cyathocrinidae have a dicyclic base. No radianal is ever developed, nor does more than one anal ever descend into the dorsal cup. Arm simple, dichotomous.

CYATHOCRINITES.

Cyathocrinites have a broadly conical or globose dorsal cup. An anal *x* is usually present in the cup, but no other anal plates. Arms simple and dichotomous. In the tegmen are a Madreporite and 4 large plates called Deltoids, over which the food-grooves pass.

CYATHOCRINUS.

Miller.

Cyathocrinus, Etym , Κύαθος, a cup.

Infrabasals 5, of equal size. Basals 5, large; 4 have acute upper angles, but the posterior basal is truncate and supports an anal *x* of roughly quadrangular shape. Radials 5, with circular or elliptical articular facet on the exterior of the plate. 1 Br very variable in number, even in an individual. Ventral sac composed of usually hexagonal plates, either smooth or slightly folded.

J. S. Miller: Nat. Hist. Crin., p. 35 (1821).
Wachsmuth & Springer: Revision I., p. 79 (1879).

Tablet 1. [Coloured diagram, lettered.] Bather: Annals aud Mag, N.H. [6] ix., p. 202, 1892.

Dissection of Dorsal cup of CYATHOCRINUS.
1 B Infrabasals, B Basals, R Radials, *x* Anal plate.

Tablet 2. [Specimen, diagrammatically coloured.]

CYATHOCRINUS ACINOTUBUS, Angelin.
Wenlock Limestone. Dudley.
Dorsal cup seen from below. [57060]

Tablet 3. [Drawings, magnified.]

CYATHOCRINUS ACINOTUBUS Angelin.
Wenlock Limestone. Dudley.
Three Arm-ossicles seen (a) from side, (b) from above showing, covering-plates, (c) from above, covering-plates removed.

Tablet 4. [Drawing, with following parts named :—
"Covering-plates." "ventral groove," "arm-ossicle," "axial anal."]
CYATHOCRINUS ACINOTUBUS, Angelin.
Wenlock Limestone. Dudley.
Transverse section of an arm-ossicle × 20 diameters. [E1367]

Tablet 5. [Drawing, slightly magnified.]
CYATHOCRINUS ACINOTUBUS, Angelin.
Wenlock Limestone. Dudley.
Radial, showing articular facet and perforate ridge. [E1450]

Tablet 6. [Drawing, slightly magnified.]
CYATHOCRINUS ACINOTUBUS, Angelin.
Wenlock Limestone. Dudley.
Articular surface of Stem-ossicle.

Tablet 7. [Two drawings, with following parts named :—
"Space, filled with calcite, formerly occupied by ligament;" "matrix filling axial canal;" "Stem-ossicle."]
CYATHOCRINUS ACINOTUBUS, Angelin.
Wenlock Limestone. Dudley.
Drawings of sections of stems, enlarged 5 diameters
a Transverse. b Longitudinal. [E1367]

Tablet 8—[at bottom of column].
The specimens and sections from which the above drawings have been made are kept in the drawers, and may be seen by students.
For other species of *Cyathocrinus* see British and Foreign Carboniferous.

Tablet 9. [Specimen.]

CYATHOCRINUS ACINOTUBUS, Angelin.

Upper Wenlock Limestone. Dudley.

Seen from the right side; shows ventral sac crossing between arms. Figd. and descd., Ann. Mag., Nat. Hist. [6] ix., p. 214. Pl. xiii. x 1. [57480]

Tablet 10. [Specimen.]

CYATHOCRINUS ACINOTUBUS Angelin.

Upper Wenlock Limestone. Dudley.

Posterior view, showing origin of ventral sac. Figd. and descd., Ann. Mag., Nat. Hist. [6] ix., p. 214. Pl. x 2. [E1450]

Tablet 11. [Specimen,]

CYATHOCRINUS VALLATUS, Bather.

Wenlock Limestone. Dudley.

Type-specimen.: Figd. and descd., Ann. Mag. N.H. [6] ix., p. 221, Pl. xiii., f 15. [E.6006.]

Tablet 12. [Specimen.]

CYATHOCRINUS VALLATUS, Bather.

Wenlock Limestone. Dudley.

Type-specimen: Figd. and descd. Ann. Mag, N.H. [6] ix., p. 221. Pl. xiii., f 18. [E.6005.]

It will be unnecessary to repeat all these labels in succeeded. stratigraphical divisions if a cross-reference to them be inserttng Other Orders, Families and Genera will however come in and require their labels and special illustrations.

It is often the case that the type-specimen, sometimes the only specimen of a species, even of a genus, in the Museum, belongs to one of the so-called Type Collections, *i.e.* "certain special collections of historical interest, which from the circumstances

under which they were formed, or came into possession of the museum, or from their containing a large number of types described and figured in standard monographs, it has not been thought desirable to break up and disperse among the general collection." Since the gallery in which these collections are exhibited is not so distant from the fossil Crinoidea as are the recent Crinoidea; and since a visitor might well find these specimens in less than ten minutes, it is enough to give a cross-reference label, *e.g.*

PHAENOSCHISMA ACUTUM, G. B. Sby. Sp.

The Type-specimen of both genus and species—

Figd. and descd. as Pentatrematites acuta, G. B. Sowerby, Zoological Journal, V. 456, Pl. xxxiii., Suppl. f. 6 a—c, 1834.

Figd. as Pentremites acutus, Gilb. Phillips, Geol. York., 2. Pl. iii. f. 4–5*, 1836.

Figd. and descd., Etheridge and Carpenter, Cat. Blastoidea, p. 276 Pl. xiv., ff. 10, 11, 12., 1886.

Will be found in the Gilbertson Collection Gallery xi., Table-case 15.

But it must be confessed that even a label as long as this does not help the student to compare the specimen with the adjacent specimens of an allied species.

The **Foreign** specimens are not yet properly arranged. In many instances specimens are merely mounted and named: in a few genera, however, not found in Britain, especially when the representative specimens are hard to decipher, drawings, diagrams or analyses are given; but even this is not enough; proper labels showing the importance of the specimens require to be written, and this is work not to be done in a hurry.

So far as possible the following principles are attended to:—

The mere fact that the Museum possesses a specimen of a species does not make that species worth exhibiting. The exhibition case is not the same as a Catalogue; and a specimen is far more accessible to the specialist if kept in the drawers.

Preference should be given to specimens exemplifying some points of structure not well shown by those in the Table-cases; or

to genera unrepresented in Britain, and these should be accompanied by descriptive labels pointing out their relationship to the British genera.

Species of importance from their wide distribution, or for some geological reason, should of course be exhibited; but the label should always give the reason why they are exhibited. If these elaborate labels seem a waste of time and space, it should be remembered that an ounce of principle is worth a pound of fact. A little conscientious work of this kind is a better touchstone of what should be exhibited than any other method.

If, after all the really instructive specimens have been thus displayed, space still remains, this may be devoted to specimens from neighbouring countries, such as are constantly visited by English collectors. Much, however, is to be said in favour of the exhibition of as complete sets as possible of specimens from British Colonies and possessions. "What should they know of England that only England know?" Science is of no nation it is true; and yet a distinctively national institution like ours may be pardoned, even praised, for doing what little is in its power to foster the unity of the Empire.

The difficulty, which cannot be disguised, of doing work on the lines here described and suggested, does not absolve us from the necessity of attempting it if we would that Museums should play that part in the education of the nation which is daily more and more required of them. Not only is the initial labour great, but there is a constant need of revision; the curator at least must never become a fossil

The labels, both for the Explanatory and Systematic series, that have been here given are by no means so good as they might be; every day suggests some improvement, but it is not every day that affords time for its realisation. Especially do the text and arrangement of the Introduction suffer from having been written during a period of transition in Crinoid morphology and terminology, a period which is hardly yet at an end. It is not, however, with the

idea of their application to other collections of Crinoidea that these labels have been laid before you, but in the hope that the principles which they exemplify may be the sooner extended to other groups and to all Museums.

TABLES AND CHAIRS.

BY F. A. BATHER.

Perhaps one who, as an assistant, has seen somewhat of visitors to Museums, and who has worked a good deal as a student in various Museums at home and abroad, may venture, even to so practical an audience, two practical suggestions.

1. In every public room of the Museum have a few seats.

It is not only elderly and weakly people that will hail this blessing, but also the student who has to stand at the cases for, it may be, hours making notes and drawings.

2. Try to have near each case, especially of fossils, a small table, shelf, or bracket.

On this the collector can lay the specimens he has brought up to compare, or the student can place his paraphernalia. The use of the glass lids of table-cases for these purposes is not to be recommended. In the Hamburg Museum a flat shelf can be pulled out from the space between the exhibition slope of the table-case and the underlying drawers.

In some Museums it would be most useful to have, for the use of the public, a few light what-nots or dumb-waiters on wheels and furnished with India-rubber buffers to prevent damage to the Cases. But the use of these as go-carts by children should be discouraged.

DISCUSSION ON MR. BATHER'S PAPER.

THE PRESIDENT expressed great pleasure at finding that Prof. Flower's scheme had been so satisfactorily put into practice. He was glad to see that in arranging the Crinoids Mr. Bather had not allowed himself to be hampered by the prejudice which kept recent and extinct animals apart in defiance of their Zoological affinities.

MR. HOYLE, in answer to an allusion made by Mr. Bather to some previous remarks of his, said that he did not deprecate keeping abreast with science, but that he thought it unnecessary for a curator to re-arrange his collections in accordance with every fresh Biological theory. But he greatly admired the scheme just put forward, and would endeavour to adopt it.

A DESCRIPTION OF

MUSEUM WALL AND FREE-STANDING CASES AND DESKS

MADE ENTIRELY OF GLASS AND IRON,

BY

DR. A. B. MEYER,

DIRECTOR OF THE ROYAL ZOOLOGICAL, ANTHROPOLOGICAL AND ETHNOGRAPHICAL MUSEUM IN DRESDEN,

WITH PLATE.

The penetrating smoke and greasy soot caused by the particular kind of brown coal, which is generally used in Dresden (being cheap fuel and found in the immediate vicinity of the town), have suggested to me the idea of constructing hermetically closed iron cases and desks, to protect the collections placed under my care against the pernicious influence of the above-mentioned enemies. I made the first trial for this purpose in 1877, a few years after entering my present position in Dresden, at that time only using iron for the frames, plinth and cornices were made of wood as usual. [*Vide* Mitth. K. Zool. Museum in Dresden III. 281—286, pl. xxvi.—xxvii., in 1878]. Not mentioning further alterations and improvements, it was not until 1886 that I proceeded to construct cases made entirely of iron and glass. I used iron-plate for the bottom, glass for the roof, shaped-iron for the cornice, and as the whole of the inner arrangement was likewise made of iron, the advantages of such cases are as follows:—

1. They absolutely prevent dust from penetrating.

2. The frames and cross-bars take up as little room as possible, and the panes of glass may be of any size.

3. They are not subject to any warping or any other alteration.

4. They cannot be damaged by fire, and if the building is of stone the collections cannot be destroyed (as happened during the revolution in Dresden in 1849).

5. They require no repairing, and might last for ever if taste and fashion were not subject to changes.

I have already given a description and illustrations of these cases and desks on four plates in 4to in 1887 (Abhandl und Berichte des Kgl., Zoolog. und Anth.—Ethn. Mus. in Dresden 1886-87). But since that time I have again introduced improvements and particularly embellishments in a large series of cases in the new galleries of the Museum, and as my above-mentioned two papers may scarcely be known in England, being published in the German language, I comply with the request of the "Museums Association" to give a short description of these cases, which have frequently been imitated, but, as far as I see, never improved. After many trials on my part these cases have at length reached a degree of perfection which I am no more able to improve. I should, however, accept with pleasure and thanks any improvement, which might certainly be suggested by others. It is easy to alter the proportions according to individual taste or necessity, as any length, height and breadth of these cases may be executed. It was necessary to take high cases for the Dresden Museum as there is not much space for the collections, for the manner in which the Zwinger has been built, nearly two hundred years ago, excludes any enlargement of the edifice whatever. I was therefore obliged to make the best of the space allotted for the collections. The height of 3 meter will seem rather too much to many people; but, according to my taste, these cases do not make an unfavourable impression, and I should recommend this size for the use of every Museum. The upper part of the case (half a meter or a whole meter in size) need not be made use of in the beginning, but only when an increase of the collection requires it, and experience has sufficiently taught that *every* collection, without any exception, wants enlargement after a certain time; besides, larger objects may be well seen though placed two meter and a half high.

These cases rest on iron feet which are 18·5 ctm. high, so that the dust may easily be swept away from underneath; if the cases reach down to the ground, the plinth will always be spoiled when the floor is cleaned, and, besides, whenever it is necessary to

remove such heavy pieces of furniture their resting on feet is of great advantage, as a truck may easily be pushed underneath and the whole case and its contents taken to another place. A case of 30 cwt. weight (or more) may be moved by two men alone, which would be utterly impossible if the cases did not rest on feet.

The doors of the cases here in Dresden are large ones, each wing of the double door being, for instance, 2 m. broad and 2·82 m. high. There are still larger doors to the cases containing the large Mammalia. The wings of single doors are 2·35 m. broad and 2·69 m. high. Objections are often made by those who do not know the working and applicability of these doors. It is thought that such doors cannot be opened or closed without difficulty or inconvenience, or that the doors give way or drag their hinges and ought to be always supported from below, &c. No such objections prove right. These doors can be locked or unlocked with the greatest facility and without any effort. and in this respect do not differ from smaller doors. They are, besides, exceedingly convenient, as each door opens the whole case—that is to say, as soon as the door is opened the contents of the whole case are visible to the spectator or curator, who can now work without any impediment. These doors never give way or lean forward, as they are not made right-angled, but sink into the right-angle by their own weight when erected.

Thus, once adjusted, they do not give way any more. They require no support, and may hang loose on their hinges like other doors, unless they are left open for several hours, or the whole day, when the large panes of glass are cleaned. In such exceptional cases small iron blocks, which can be screwed higher or lower as required, would serve for this purpose and may be ready for use near every third or fourth case in the Museum. Technical and practical points of view easily show the limit of the size of doors with one wing only; whenever exceeding that limit, doors with two wings must be used, which are on the whole preferable for long cases, and must then be made as large as possible.

The back of the wall cases is made of iron plate 2 mm. thick.

Free-standing cases with doors on both sides may be supplied

ad libitum, with a moveable partition, a large iron frame covered with cloth being inserted. As the depth as well as the other dimensions of these cases may be made according to liking, deep cases may be turned into narrow ones by means of these movable partitions, leaving the inner space free or unused. Wall cases may also be made deeper or shallower by employing these partitions. It would therefore be advisable to make cases as deep as space will permit of, as they can easily be made shallower by such a partition, but never deeper than their original size.

All the iron used for the cases is forged iron. The breadth of the outside frame of the case is 4·7 cm., of the door-frame, 3·8 cm., together 8·5 cm.

A groove runs round the whole frame and the fillets of the door fit into it. Double-winged doors have the groove in the middle part of the one wing, the fillet in the middle part of the other wing, so that the doors may also here fit close into each other. The hollow of the groove is 19 mm., the fillets are 30 mm. long, and in the hollow of the groove cylindrical stripes of cotton-wool are fixed, which are pressed tightly by the projecting fillet when the door is closed. This, combined with the iron construction of the cases, will *entirely* prevent the dust from penetrating into the cases. The upper frame is made of strong angle-iron, and the cornice of forged iron as well as the T iron which forms the upper glass-rabbet, are rivetted to it.

For the fastening of the door a Bascule-lock is used, the bolt of which catches in at the top, at the bottom and in the middle by turning a key; in this manner the door is closely fastened all the way down. A patent lock, if required, is easily applied.

Plate-glass is the best for the glazing, *one* large pane for each door. It is a mistake to think the weight of the panes might be too great for the door-frames; this will never be the case, as experience has proved, if the frames are not made right-angled. The panes are not fastened with putty, but a quadratic iron bar which runs all around is screwed on and the pane is fixed tightly underneath, only a space of a few mm. breadth between the pane and the bar is filled up with putty. Small wooden pegs must

be put between the pane and the frame, where it is needed; experience will soon teach any clever glazier how to manage best, and the doors will then work perfectly.

If the expense of such large panes of glass is to be avoided, iron bars may be put cross-wise into the door and smaller panes of plate-glass fixed in or even panes of Rhenish glass 6/4 thick will be sufficient, although they are less smooth and give a more or less distorted view of the objects placed behind them. In this case too rabbets of putty, being disadvantageous, must be likewise avoided, and quadratic iron bars must be used for fixing the panes into the cross-bars. The latter are made of thin T iron and placed so that the middle shank looks outside, which gives a more pleasant view than if the broad side of the T iron is to be seen in front, which is often done inconsiderately. The bars may cross the door in the middle or at two-thirds of the height, the latter being preferable for high doors.

For the top of the cases frosted glass is used, which is preferable to transparent glass as it throws a more equal light on the contents of the case. Here in Dresden frosted glass is likewise taken for the panes at the side of cases, which are placed in the niche of a wall.

Four hinges used to be considered necessary for large doors, but now they are made with three hinges only. The bands of these hinges, which used to be fastened *on* the frame, are now fixed *into* it, thus greatly improving the aspect of the cases. The side parts of the Bascule locks are likewise fixed *in* the frames and *not on* them as used to be done.

The inner arrangement for placing the objects to be exhibited is likewise made entirely of iron; it consists of strong bands of angular iron, furnished with the necessary number of holes, and must be placed in the corners—never in the middle, as that would look awkward. T iron brackets of different length, made to fit in tightly, are hooked into the holes. The brackets are of different sizes, as required, their length increasing from 10 centimetres. For placing the objects to be exhibited, iron bands are laid on the brackets; these bands may be made of T iron or of flat-iron,

thick or thin, according to the weight they have to carry. For smaller objects two T iron bands are placed closely together, so that they have a breadth of 45 mm., or coupled together, leaving a space free in the middle. For larger objects a larger space must be left between the two bands. For objects in spirits of wine in glass the bands are also coupled together and a plate of sheet-iron is put on them. The advantage of this arrangement is this, that the thick and broad wooden boards, which easily warp and are heavy and troublesome to move, are disposed of. Besides, the light has free access into all parts of the case, and the objects placed lowest have a better light than they used to have in cases furnished with wooden boards.

Plates of glass may also be laid on the iron bands for the objects to stand upon.

The cases may be painted inside and outside *ad libitum;* a dark green bronze colour, imitating iron, is recommended for the outside; a neutral greyish or yellowish white for the inside. Taste being very different, there are scarcely two of all the existing Museums which agree in this respect.

Iron plates of any size, upon which the contents of the cases are marked, may easily be fastened to the top of the cases.

The *desks* are also made *entirely* of iron and glass; they may have any size or height, and double desks may be constructed with or without a central case. The outside frame is only 1 cm. broad, and that of the lid 2·4 cm., the whole framework being thus only 3·4 cm. Desks that are 2 m. long and 0·80 m. broad have one whole pane of glass, screwed into the lid with four-cornered iron bars. The front height is 0·85 m., which I consider the most advisable. Concerning the slope of the two principal flats of the desk, several combinations are possible, three of which I only took into consideration:—

1. The bottom and lid have no slope whatever, but are parallel and horizontal.
2. The bottom is horizontal, the lid slopes.
3. The bottom and the lid are sloped and parallel.

The angle of incidence, too, may vary. Combination 3, which

I prefer, has a slope 1 : 5·33, that is, the flats 80 cm. broad rise 15 cm., or the back of the desk is 15 cm. higher than the front. This appears to me the due proportion.

The advantage of this arrangement is this—that the objects placed behind are nearer to the eyes of the spectator, who is not obliged to stoop in order to examine them. The same advantage may of course be gained with combination 1 and 2 by placing the objects in the desk gradually higher on a stand; but this is complicated as well as superfluous.

The desks may have any depth They stand on four quadratic iron-feet which are screwed on; but they may also rest on a wooden stand furnished with drawers. Stands with drawers of iron or plate-iron are certainly to be preferred, but as they are very expensive they must generally be dispensed with.

The upper lid, which closes the glass-box is fastened to the back of the desk with three joints and is closed in front with two locks, which are entirely fixed *into* and *not on* the frame. By means of two small handles, fastened to the lid in front, which may be turned round and are formed like a T, the lid may easily be opened and closed. These handles must not be higher than the frame. To keep the lid open a mechanism like a knee-jointed lever with springs is fastened to both narrow sides of the desk. When the lid is to be closed, this mechanism shuts after a pressure against the springs. The rabbets of the frame-work, into which the lid catches, are constructed in the same way as in the above mentioned cases.

The advantages of such desks are as follows:—

1. They have an exceedingly narrow frame with one whole pane of glass on the top and undivided narrow panes of glass on the sides.
2. The objects placed at the back are brought as near as possible to the eyes of the spectators on a sloping bottom.
3. They close hermetically.
4. They do not require repairing.
5. They stand exceedingly firm.
6. Fire can do them no harm.

The price of the cases and desks varies according to their size, the larger ones being relatively cheaper. Wall cases are cheaper than those standing free, as the latter have doors on both sides, which increase the expense.

I have noted the prices of some of the sizes of cases and desks as they have been constructed by Messrs. Aug. Kühnscherf & Sons, here in Dresden. The inner arrangement, as bars, brackets, iron plates, etc., being included, the cases and desks are ready for use at the following prices :—

Cases standing free—	With panes of Rhenish glass. £	With one large pane of Plate-glass for every door. £
2·45 m. long, 1·20 m. deep, 3 m. high,	M. 1300=75	M. 1800= 90
*4·00 ,, ,, 1·20 ,, ,, 3 ,, ,,	1700=85	,, 2500=125
*4·00 ,, ,, 1·20 ,, ,, 2·75 ,,	— — —	,, 2200=110
*4·00 ,, ,, 1·00 ,, ,, 3 ,,	— — —	,, 2400=120
*3·00 ,, ,, 0·50 ,, ,, 2 ,,	— — —	,, 1500= 75
2·00 ,, ,, 0·60 ,, ,, 1·20 ,, ,,	500=25	— —
1·23 ,, ,, 0·76 ,, ,, 2·15 ,,	— — —	,, 900= 45
**1·50 ,, ,, 1·50 ,, ,, 2·75 ,,	— — —	,, 1600= 80
1·90 ,, ,, 1·20 ,, ,, 2·75 ,,	— — —	,, 1400= 70
Wall Cases—		
*4·93 ,, ,, 1·20 ,, ,, 3 ,, ,,	1800=90	,, 2200=110
*3·48 ,, ,, 1·20 ,, ,, 3 ,, ,,	1500=75	,, 1900= 95
2·60 ,, ,, 1·20 ,, ,, 3 ,, ,,	1200=60	,, 1300= 75
*4·00 ,, ,, 1·00 ,, ,, 3 ,,	— — —	,, 1900= 95
*3·00 ,, ,, 0·50 ,, ,, 2 ,,	— — —	,, 1100= 55
1·90 ,, ,, 1·20 ,, ,, 2·75 ,,	— — —	,, 1100= 55
Desk—		
2·00 ,, ,, 0·80 ,, ,, 0·15 ,, ,,	260=13 —	— —†
‡2·60 ,, ,, 0·80 ,, ,, 0·15 ,, ,,	360=18 —	— —
‡3·40 ,, ,, 0·80 ,, ,, 0·15 ,, ,,	460=23 —	— —

* Folding-door.

** Four doors.

† Plate-glass not advisable for desks, because too heavy.

‡ With double lid.

DISCUSSION ON DR. MEYER'S PAPER.

THE PRESIDENT commended the lightness and strength of the Dresden cases mentioned by Dr. Meyer, and spoke of similarly constructed cases that he had seen elsewhere. He especially urged the use of *glass* shelves which, he pointed out, at once allowed the objects placed on them to be well seen and permitted light to pass through to objects beneath.

MR. BUTLER WOOD said that he could not understand what advantages iron frame-work had over wood, nor did he see why Dr. Meyer had the frame of his doors made out of square. From his experience at Bradford, he should say that dust could be quite thoroughly kept out by putting india-rubber strips round the case door frames.

MR. HOWARTH maintained the superiority of iron over wood, the former being stronger for any given bulk and not being subject to warping. He also pointed out that a serious objection to the use of india-rubber was its gradual loss of elasticity.

MR. HOYLE pointed out, in answer to Mr. Butler Wood, that the object of the shape of door-frame mentioned by Dr. Meyer was to counteract the weight of the plate glass panes. If the door-frame were rectangular, the weight of the glass would pull the door downwards and forward and thus cause it to stick. By making it not quite rectangular it could be arranged so that the weight of the glass should just pull it into its right place.

ON SOME RECENT MUSEUM LEGISLATION,

BY

E. HOWARTH, F.R.A.S.

A Bill, entitled the "Museums and Gymnasiums Bill," was introduced into Parliament during the session of 1891, and became law on the 3rd of July. As it contains provisions of some importance to Museums, and offers the means of increasing their income it will probably be found interesting to publish the principal classes in the Museums Association Report.

Clause 1 gives the short title;

" 2 Extent of Act;

" 3 Adoption of Act.

The first section of this clause is as follows: "This Act may be adopted by any urban authority for their district either wholly or so far as it relates to Museums only or to Gymnasiums only."

Section 2 of clause 3 relates to the method of adopting the Act, which shall be by a resolution passed at a meeting of the urban authority.

The next two clauses are sufficiently important to be quoted in full.

Clause 4.—"An urban authority may provide and maintain museums for the reception of local antiquities or other objects of interest, and gymnasiums with all the apparatus ordinarily used therewith, and may erect any buildings and generally do all things necessary for the provision and maintenance of such museums and gymnasiums."

Clause 5.—"A museum provided under this Act shall be open to the public not less than three days in every week, free of charge, but subject thereto an urban authority may admit any person or class of persons thereto as they think fit, and may charge fees for such admission, or may grant the use of the same or of any room therein either gratuitously or for payment, to any person for any

lecture or exhibition, or for any purpose of education or instruction, and the admission to the museum or room, the use of which is so granted, may be either with or without payment as directed by the urban authority, or with the consent of the urban authority by the person to whom the use of the museum or room is granted."

Clause 6 relates to the admission to gymnasium.

The next clause relates to bye-laws, and is as follows:—

Clause 7.—(1) An urban authority may make regulations for all or any of the following matters, namely:—

(*a*). For fixing the days of the week or hours of the day, as the case may be, during which the museum or gymnasium is to be open to the public free of charge.

(*b*). For giving special facilities to students for the use of the museum.

(*c*). For fixing the fees to be paid for the admission of persons to the museum, and for the use thereof either by students or in any other special manner.

(*d*.) For regulating the use of the gymnasium either by classes or otherwise, and fixing the scale of fees to be paid for such use.

(*e*.) For prescribing conditions which the exclusive use of the museum, or any room therein, or of the gymnasium, is granted in any case.

(*f*.) For determining the duties of the instructor, officers and servants of the urban authority in connection with a museum or gymnasium.

(*g*.) Generally for regulating and managing the museum or gymnasium.

(2). The urban authority may make bye-laws for regulating the conduct of persons admitted to the museum or gymnasium, and may by any such bye-law provide for the removal from the museum or gymnasium of any person infringing any such bye-law by any officer of the urban authority or by any constable.

Clauses 8 and 9 relate to the closing of museums for repairs, and to the appointment of officers.

Clause 10 enacts that the fees received under the Act shall be

applied in defraying the expenses of the museum and gymnasium; and states the conditions under which money can be borrowed, these being generally similar to the conditions in the other Library and Museum Acts. The last section of this clause is very important, and is as follows:—Clause 10 (5)—"The amount expended by an urban authority under this Act shall not in any year exceed the amount produced by a rate of a half-penny in the pound for a museum, and the like amount for a gymnasium established under this Act."

Clause 11 relates to the acqusition of land.

Clause 12 gives authority to sell the museum at the end of seven years if found unnecessary or too expensive; and gives directions as to the application of the proceeds of such sale.

Clause 13. "All powers given to an urban authority under this Act shall be deemed to be in addition to and not in derogation of any other powers conferred by Act of Parliament, law, or custom, and such other powers may be exercised in the same manner as if this Act had not been passed."

The other clauses relate to the application of the Act to Ireland, and it is also stated that the Act shall not extend to Scotland or the administrative county of London.

From the foregoing summary it will be seen that this Act confers considerable powers on local authorities to establish and regulate museums in addition to the powers already given by previous Library and Museum Acts. The most important powers given by this Act are as follows:—

A rate of a half-penny in the pound may be levied for a museum alone, independently of the penny rate under other Acts for libraries, so that a town establishing a library and a museum could levy rates for these purposes of three half-pence in the pound.

It is not necessary that museums should be open every day free, but only on three days a week; and on the other days a fee may be charged for admission, or the museum could be let to other persons for their sole use, and a fee charged for such use.

The Act may be adopted by a resolution of the urban authority without taking any vote of the ratepayers.

These powers all tend in the direction of facilitating the establishment of museums; but there is much yet required to free them from the harrassing legislative trammels that hinder their progress, and it would, I think, quite come within the scope of the Museums Association to draft a Bill dealing with the whole of the requirements of museums.

DISCUSSION ON MR. HOWARTH'S PAPER.

MR. MADELEY said that the new Bill appeared to him to have been drawn up without reference to the Libraries Act. In support of this statement he pointed out several flaws and redundencies in the Bill.

MR. SHORE was of opinion that the Association should in its corporate capacity have given advice on the Bill in its early stages. He also thought that the Association should take active steps to secure for museums some part of the funds to be devoted to Technical Education.

MR. PLATNAUER pointed out to Mr. Shore that for the Association to have acted as a body, a general meeting, or at least a council meeting, would have been necessary, and that there was great difficulty in the way of holding either of these meetings. The Bill had not, however, passed unnoticed. He had himself written, urging his position as a Secretary of the Association in excuse, to Mr. F. S. Powell, one of the promoters of the Bill, pointing out certain objections to a clause affecting the sale of museum collections. Mr. Powell had replied very courteously, stating that the clause in question was defective, but that it had been remedied by the insertion of a further clause providing that any such sale must be first authorised by the Board of Trade.

MR. CAMERON insisted on the necessity of watching all legislative action affecting museums and of advising the framers of Bills where advice was needed. He would further suggest that the Council of the Association should petition Parliament to make a certain amount of teaching in Natural Science part of the curriculum in Elementary Schools.

MR. OGLE pointed that the Bill had been modified in the House of Commons, and wished to know if Mr. Howarth had quoted from the Bill as originally drafted or from its final form.

MR. SHORE suggested that the Council should be empowered to apply to County Councils for part of the grant made for Technical Education.

MR. HOWARTH stated, in answer to Mr. Ogle, that he had quoted from the draft that was sent to the House of Lords. He would urge some efforts to obtain the consolidation of Library and Museum legislation. He also considered that an Act was required to increase the amount levied for museums.

MR. MADELEY suggested communicating with the Libraries Association before taking action. He was of opinion that a separate sum should in all cases be raised for the maintenance of a museum.

REPORT OF THE COMMITTEE

APPOINTED TO CONSIDER THE QUESTION OF SECURING THE HELP OF

SPECIALISTS FOR MUSEUM CURATORS.

The aim of this Committee (appointed at the suggestion of Mr. Rudler at the Liverpool meeting) has been to devise some means of helping curators to name specimens in cases where their special knowledge does not enable them to do so. Many cases, unfortunately, occur in which curators with very imperfect libraries at their command and with no specialists to consult, are compelled to leave specimens unnamed and, consequently, unarranged. It is unnecessary to dwell on the utility of any scheme which would remedy such a state of affairs, or even mitigate the evil.

The most important thing to be done is to give the curator an opportunity of knowing who could help him most efficiently. The Committee would therefore suggest the following simple method of working:—

A small body, acting as a committee of advice, should undertake the task of suggesting to any curator desiring help the specialist or specialists best fitted to help him. Should any curator wish a collection named, he would write to the secretary of the committee. The secretary, after consultation with his committee, would tell the curator who could best do the work required, and would also state what the charge for such work should be. This done, the matter would rest between the curator and the specialist thus selected.

This Committee therefore presents itself for re-election in order to start the scheme and to see to the due propagation of the above proposal amongst curators, provided that the proposal be approved by the Association.

H. M. PLATNAUER,

Secretary to the Committee.

[The above report was adopted by the General Meeting. The Committee accordingly invites applications from curators desirous of having specimens named.]

REPORT OF THE COMMITTEE

APPOINTED TO CONSIDER

LABELLING IN MUSEUMS.

The Committee appointed to consider the question of labelling in Museums, invited a number of Museums to send samples of their labels for the Committee's consideration and guidance. The following labels were sent in :—

LIVERPOOL :—Printed descriptive labels of the groups of Invertebrates ; printed labels for individual species, giving descriptions of the habits and habitat; plain labels, of different colours, for writing particulars of the specimens on, the colours used being yellow, green, and black, the latter having the letters painted in white. The name of the Museum printed on some of the labels.

MANCHESTER :—Printed names in block type, of a bright red colour for the different groups of animals, the principal Divisions of the Animal Kingdom being in large letters, and the orders and sub-orders in a smaller but still conspicuous type ; individual specimens in black, the Geological labels having a red border, and the Zoological black ; locality on left-hand corner, and the donor's name on right. The name of the Museum not printed on any of the labels. No written labels.

SUNDERLAND :—All the labels printed in black with a red border, the families having neat descriptive labels. The name of the Museum not given on the label.

NOTTINGHAM (University) :—Principally black cards of various sizes, with bevelled gilt edges, and white letters gummed or pasted on. Smaller labels with red lines and borders. Fossil labels printed with four lines Genus ; Species ; Locality ; Rock. Small charts of the world with the Geographical distribution marked in red.

SAFFRON WALDEN:—Labels with black and red borders, the names printed on. In the case of birds, sex, age, locality, date printed, with space left for filling in these particulars. Geological chart prepared by hand, with the formation, coloured and written description.

YORK:—Names of classes, orders and families, Geological formations, &c., printed in black with black borders. Names of fossils, shells, &c., printed at the Museum, cream and white papers used.

BOOTLE:—Black card on which the names, &c., are painted.

HANLEY:—Green label, with the name of the Museum printed on the top.

PAISLEY:—All lables printed in black on white ground. No name of Museum. All printed at the Museum.

BLACKBURN:—Printed labels, chiefly in black, but three in red. Names of primary groups on blue-grey ground, others on white, cream, and grey.

STOCKPORT:—Labels headed with name of Museum in prominent type. Red borders, black letters, lines "Name," "Loc.," "Presented by," for Zoological labels; the Geological labels commencing "Formation," "Name," "Locality."

WOLVERHAMPTON:—Labels in white, neutral greys, light green and brown, some of them mounted on black cards, some printed in black and others in brown. Name of Museum at the bottom of some of the labels. The brown letters on grey card are pleasing.

PRESTON:—Grey card with letters printed in prominent black type.

CARDIFF:—Black Glazed papers, with white labels, printed in black ink with black lines.

BRADFORD:—A great variety of labels; gilt card with black letters with white shading; white label on black card with red edge; blue-black card with silver letters; black cards with gilt letters; and tinted cards with black letters.

MIDDLESBROUGH :—Paper labels with dotted lines, the Geological labels being headed : "Genus," "Species," "Formation," "Locality."

SHEFFIELD :—Vertebrates, with names painted on the stands, or with white lettters on black card ; Invertebrates, with plain white labels, the particulars printed on in black ink by hand, the other objects white letters painted on black, chocolate, or dark green card. Printed and written descriptive labels of the principal groups of the Animal Kingdom, down to orders. For minerals, the lines are headed : "Name," "Synonym," "Crystal. Form.," "Chem. Comp.," "Matrix.," "Locality ;" and for fossils : "Genus," Species," "Reference," "Formation," "Locality."

Curators of Museums were also invited to send suggestions on the subject of labelling, and some of these may here be quoted.

Mr. J. J. OGLE, of the Bootle Museum : "I think labels for groups of greater or less value should be printed in different colours, and that the ground colour should be chosen to give the greatest clearness possible, with a fair amount of æsthetic effect. The advice of an artist would be useful here."

Mr. FREDERICK JAMES, of the Maidstone Museum : "White card, or a white label of any kind is to be deprecated. Many collections have their appearance entirely spoilt through the staring effect produced by the rows of white labels describing the specimens. I, myself, greatly favour a dull black ground with plain block type letters, in white or gilt, similar to those in use at South Kensington. I am of opinion, therefore, that an uniform system is much to be desired for such departments in a public Museum as Ornithology, Geology, and Botany, in which the general arrangement is fixed by established rules, but in divisions relating to the fine arts, special labels are more appropriate, and should be designed so as to harmonize with the nature of the object exhibited."

In all the above examples of labelling, there does not appear to be any Museum in which there is a definite and regular system of

labelling throughout, except at Owen's College, Manchester, and there the system only includes names and does not embrace any systematic scheme of descriptive labels. These, however, seem to be adopted according to a definite plan at Liverpool, Sunderland, and Sheffield. A careful consideration of the labelling at the different Museums mentioned above, points to the following facts:—

That coloured letters, except black and white, are not used to any extent in any Museum except Manchester.

That the most generally adopted style is black letters on a white or neutral tinted ground.

That many Museums are also adopting white letters on a black or dark coloured ground.

That different types are used to express the magnitude of the Zoological or Geological divisions, the primary groups having the largest type, and descending in size downwards to families and genera.

Judging from these consideration, it seems to be possible to adopt one general scheme of labelling for the following:—

The Zoological divisions, down to orders; having one kind of type for the sub-kingdom, another for the class and sub-classes, another for the order and sub-order. Not only should the technical name of the division be given, but also the names of animals included in it, example Rodentia:—Gnawing Animals: Beavers, Rats, Hares, &c. Probably the best case labels would be black or dark coloured cards with white letters, the largest sized letter to be one inch for the primary groups, and diminishing to half-inch for the orders. Such labels as these would be available for all Museums; but, as many Museums do not contain specimens to show families and genera, it would not be necessary to have labels beyond the orders, but those would serve as example for minor divisions where required.

A similar series of labels for the Geological divisions.

In addition to these name labels, a suitable descriptive label, printed in black on a white or tinted ground, might be prepared

for each one of the divisions, and each to occupy about an octavo page.

These labels would be of universal application.

Coming to labels for individual specimens, there is more difficulty in devising a plan that would be applicable to all Museums.

There are, however, some groups of animals which find a place in most Museums, such as British Birds, British Insects, &c.

At Saffron Walden, some time back, the Museum printed a set of labels for British Birds, and tried to arrange with other Museums to join with them in taking copies of those labels with a view to securing an uniform system. Lists of labels for British Insects have also been frequently published, and also lists of British Shells.

The Association, therefore, might issue suitable labels for British Birds, Insects, and Shells. The former would serve as samples for the style of labelling all Vertebrates, and the two latter as samples of style for Invertebrates.

The small charts showing Geological distribution from Saffron Walden, and Zoological distribution from Nottingham, are extremely useful and interesting and might very properly be adopted in all Museums.

Labels for individual Fossils and Minerals need not be of a very elaborate character. For Fossils a label to fix on the tablet and giving the name, locality, and formation, would probably be sufficient. A similar sort of label, but giving the name, crystal, form, chemical composition, matrix, and locality, would serve for the Minerals.

The Committee recommends that specimens of the labels proposed above should be printed in the Museum Report for the present year and the cost stated, and that Curators of Museums should be asked to express their opinion upon them, and if they approve of the labels, to state whether they would be willing to subscribe for a set if uniform sets were provided.

They also recommend that the Committee be re-appointed, with Mr. Howarth as Secretary.

E. HOWARTH,

Secretary to the Committee.

SPECIMEN LABEL.

ORDER: RODENTIA.

RODENTS.

The Rodents are more numerous in species than any other order of mammals, are all herbivorous and have a wide distribution, being found in nearly all parts of the world. They all present a great similarity in general structure, and none of them attain a large size, the largest of them being the Capybara. The order is well defined, and at once recognised by the dentition, which consists of 2 prominent incisors in each jaw, premolars and molars, but there are no canines. The Picas, Hares and Rabbits have two pairs of incisors in the upper jaw, the second pair very small. The incisor teeth grow from a permanent pulp, their edges being constantly worn away by gnawing, this gnawing (from which the animals take their name of Rodents or Gnawing Animals) is absolutely necessary to the existence of the animal, for as the teeth are continually growing and take the form of a segment of a circle they would curve round into the mouth if they were not continually worn away, and this actually occurs when a tooth is accidentally fractured. Rodents are very diverse in their habits, some live on trees as, Squirrels; some have the skin developed into parachutes on their sides and can take flying leaps from tree to tree; others are runners, such as Hares and Rabbits; the Jerboas have the hind legs longer than the fore legs and are agile jumpers; the Mole-rats are diggers; and the Beavers and Water Voles are aquatic. The fur of many Rodents has a high commercial value such as the Beaver, Squirrel, Chinchilla, &c. The order Rodentia comprises 3 extinct and 18 recent families. The recent families include the following:—(1) Anomalurus; (2) Squirrels and Marmots; (3) Haplodon; (4) Beavers; (5) Dormice; (6) Lophiomys; (7) Rats, Mice and Voles; (8) Mole-rats; (9) Pouched Rats; (10) Jerboas; (11) Spiny Mice; (12) Porcupines; (13) Chinchillas; (14) Dinomys; (15) Cavies; (16) Agouties; (17) Picas; (18) Hares and Rabbits.